HITACHI

SERVICE MANUAL

TK | No. 3039E

VT-M619EM

Technical Information

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VHS

This video deck is a VHS type video recorder. For proper operation, only the VHS type cassette must be used.

Manuals related to the VT-M619EM (DS,GK)

Name of Manual	Language	Manual No.
Technical Data	English	3038E
	German	3144G
Technical Information	English	3039E
	German	3145G

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

VIDEO CASSETTE RECORDER

July 1989 TOKAI WORKS

COMPARISON WITH PREVIOUS MODEL

	ITEM	VT-M619EM	VT-510E SERIES
FEATURES	COLOUR SYSTEM THAT CAN BE RECORDED AND PLAYED BACK	4.43 MHz NTSC, PAL, MESECAM, SECAM (NO COLOUR)	PAL, MESECAM, SECAM (NO COLOUR)
	TUNER DS MODEL GK MODEL	B/G PAL, I PAL, B/G SECAM B/G PAL, D/K PAL, B/G SECAM, D/K SECAM	* *
	RF CONVERTER DS MODEL GK MODEL	G, I G, K	
	TAPE SPEED	23.39 mm/s (PAL, MESECAM, SECAM) 33.35 mm/s (NTSC PB) 33.69 mm/s (NTSC REC)	23.39 mm/s --- ---
	HQ (HIGH QUALITY)	USED	*
	TRICK PLAY	VISUAL SEARCH, STILL, F.ADV	*
	AUTOMATIC CONTROL FUNCTION	PLAY, REWIND, REWIND SHUT OFF, OPERATE ON, EJECT	*
	NOISE LOCK SEARCH FUNCTION	YES	*
	WIRELESS REMOTE CONTROL	WITHOUT LCD DISPLAY	DISPLAYS DATE & CLOCK
	TIMER RECORDING PROGRAMMES	4 PROGRAMMES/1 YEAR	*
	TIMER BACKUP TIME TIMER PROGRAMMED TIME DISPLAY	NO START AND STOP SEQUENTIAL	*
	IRT	CAN SET LENGTH	*
	TAPE COUNTER INDICATOR	CLOCK/COUNTER SWITCH	*
	MEMORY STOP OPERATION MODES	REWIND AND F.FWD	*
	CHANNEL TUNING FUNCTIONS	VOLTAGE SYNTHESIZER	*
	EDIT SWITCH	YES	*
	ONE-BUTTON RECORDING	YES	*
CHASSIS	BASIC CHASSIS TYPE	Z	*
	CYLINDER MOTOR	THREE-PHASE OUTER ROTOR FG: 300Hz	*
	VIDEO HEADS	2 HEADS CH-1/CH-2: 57 µm CONNECTOR TYPE	*
	HEATER	NONE (HEAT SINK USED)	*
	DEW SENSOR	NO	*

	ITEM		VT-M619EM	VT-510E SERIES
MAIN CONTROL ICs	VIDEO SYSTEM SYSTEM	Y.SIGNAL PROCESS	HT4947C(IC201)	HT4907P(IC201)
		CHROMA SIGNAL PROCESS	HES8463A(IC301)	HES8455C(IC204)
		SECAM MODE DISCRI.	BA7025L(IC351)	*(IC1301)(CT,VPS,DS)
		PRE/REC AMP	BA7212S(IC001)	*
		IH DELAY	MSM6965RS(IC203)	*
		NTSC-PAL CONVERTER	HES8081B(IC204)	NO
	AUDIO SYSTEM	REC/PB AMP	LA7295(IC401)	*
	JACK	AUDIO INPUT SWITCH	TRANSISTORS	*
		VIDEO INPUT SWITCH	HES8053(IC1501)	*
	SERVO SYSTEM	SPEED/PHASE CONTROL	BU7245S(IC601)	*
		AMP & SHAPER	LA7116(IC602)	*
		CYLINDER MOTOR DRIVE	LB1624H(IC603)	*
		CAPSTAN MOTOR DRIVE	SA2006A(IC01)	*
		5-CFG GENERATOR	HD14046(IC602)	NO
		DIVIDER	HD14520(IC1603)	NO
		PAL/NTSC SELECT SW	BU4053(IC1605)	NO
	SYSTEM CONTROL	SYSTEM CONTROL μP	CPX5058-175(IC701)	*
		LOADING MOTOR DRIVE	BA6209 (IC902)	*
	TIMER	TIMER μP	CPX5058-175(IC701)	*
		EAROM	CSK1013P(IC903)	*(IC702)
	CH-TUNING SYSTEM	TUNING CONTROL	CXP5058-175(IC701)	*
			LA7938(IC801)	*
	POWER SUPPLY	12V REGULATOR	M5F78L12(IC853,IC1502)	*
		5V REGULATOR	M5F805(IC1504)	*
			LM340CT02(IC1505)	*

* means that the contents are the same as listed in the left column.

CHAPTER 1 MULTI-COLOUR SYSTEM

1-1 Colour System Switching Circuit

Fig. 1-1 is a simplified block diagram of the colour system switching circuit. The switching of the colour system is performed by colour system select switch S301, colour signal modify switch S302 and SECAM mode discriminator IC351. SECAM mode discriminator IC351 outputs "Hi" to pin 9 of chroma processor IC301 and QR209 via pin 16, when the chroma signal to be recorded or played back is SECAM.

When IC301 pin 9 is "Hi", IC301 defeats the colour killer detector stage and permits the chroma signal pass the colour killer stage in the IC. When pin 9 is "Hi", IC301 also stops the phase rotation of the local oscillator carrier, which stops the phase rotation of the SECAM chroma signal to be frequency-converted. QR209 turns on to form a trap circuit in the SECAM mode, and eliminates the SECAM chroma component remaining in the luminance signal to be recorded to prevent noise from appearing in playback.

When colour modify switch S302 is in the "on" position in the NTSC mode, it outputs "Hi" to pin 3 of NTSC-PAL chroma converter IC204. If pin 3 is "Hi", IC204 converts the 4.43 MHz NTSC chroma signal to a PAL chroma signal, and if it is "Lo", IC204 outputs the input chroma signal (PAL, SECAM or 4.43 MHz NTSC chroma signal) as it is.

Only when colour system select switch S301-2 is in the "colour" position, the output of the colour killer detector stage in chroma processor IC301 is shorted to earth and the function of colour killer detector is defeated. In this case, the chroma signal cannot be blocked by the colour killer stage in IC301. This function serves to produce stable colour when the input chroma signal is low in level or includes noise.

When colour system select switch S301-1 is in the NTSC position, it outputs "Hi". The output of S301-1 is supplied to the following parts: QR351, QR201, QR208, QR202, pin 27 of luminance processor IC201, pin 9 of input select switch

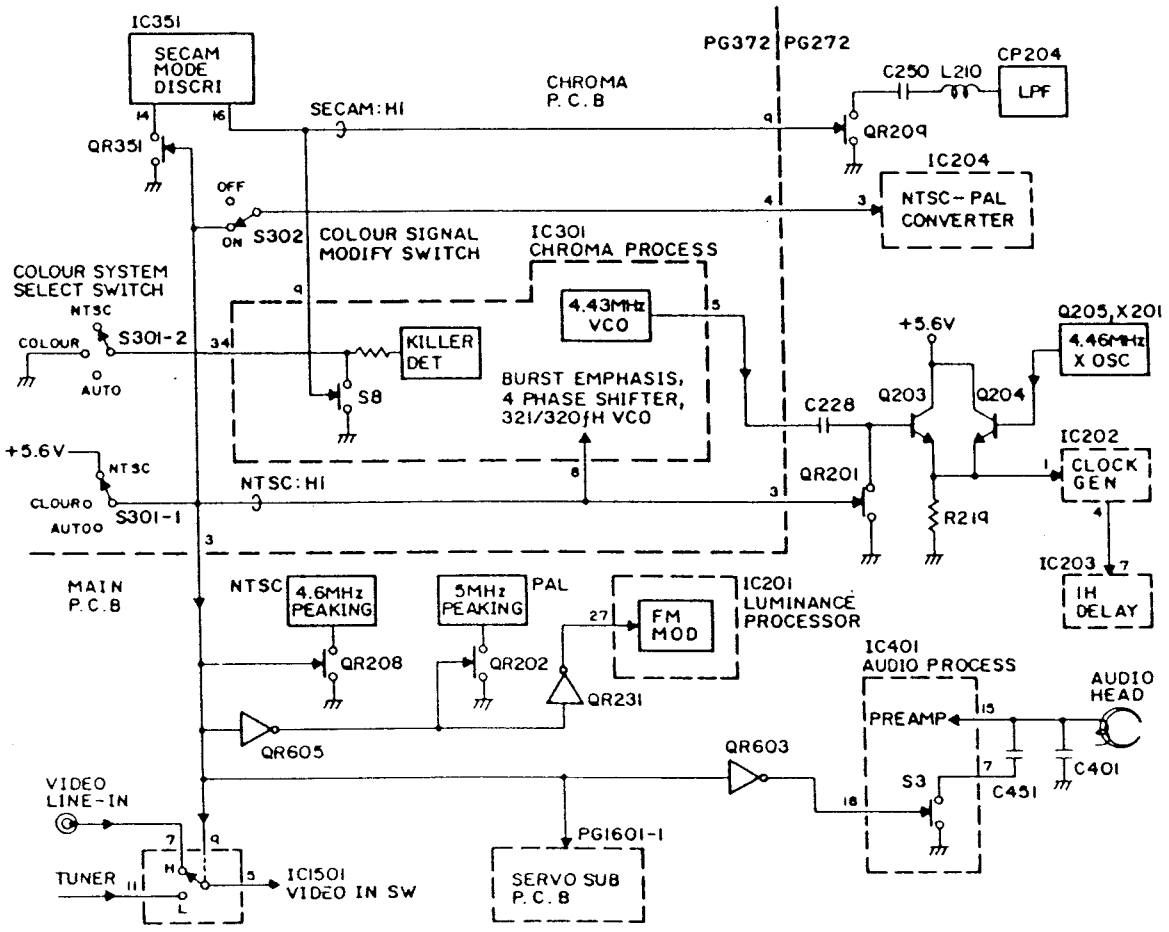


Fig. 1-1 Colour System Switching Circuit

IC1501, servo sub P.C.B, and pin 18 of audio processor IC401; and each part performs the following functions.

QR351 turns on in the NTSC mode and shorts pin 14 of IC351 to earth to defeat the SECAM mode discrimination function and prevents the SECAM mode from being set by IC351.

QR201 turns on in the NTSC mode, and makes Q203 turn off and Q204 turn on. This blocks the 4.43 MHz carrier signal generated by IC301 to flow to 1H delay device IC203 and permits the 4.46 MHz carrier signal to enter IC203. The 1H delay device is used for dropout compensation and noise reduction, and its delay time must be 64 µs in the PAL mode, and 63.5 µS in the NTSC mode. To shorten the delay time by 0.5 µs in the NTSC mode, the clock pulse frequency is increased by 0.03 MHz in the NTSC mode. The carrier passed through the switching circuit consisting of Q203 and Q204 is applied to clock generator IC202 where its frequency is doubled and becomes a clock pulse which drives the 1H delay device.

The frequency deviation range of frequency modulation is different depending on the colour system and is from 3.4 MHz to 4.4 MHz in the NTSC system and from 3.8 MHz to 4.8 MHz in the PAL system.
When "Hi" is applied to the FM modulator in luminance processor **IC201** via QR605, QR213 and IC201 pin 27, the frequency deviation range is switch to that of NTSC.

To make the overall playback frequency response from the video heads to the luminance processor flat, the high frequency band of the FM signal played back is boosted by the peaking circuit. As the frequency deviation range of the regenerated FM signal is different depending on the colour system, the frequency band to be boosted must be switched depending on the system. In the NTSC mode, the frequency band in the vicinity of 4.6 MHz is boosted and in the PAL mode the frequency band in the vicinity of 5 MHz is boosted. In the NTSC mode, **QR208** turns on to activate the NTSC peaking circuit. **QR202** activates the PAL peaking circuit.

This unit is not provided with an NTSC tuner and can only record the NTSC video signal supplied via the video line-in jack. So, in the NTSC mode, as "Hi" is applied to pin 9 of input select switch **IC1501**, IC1501 selects the line-in video signal, not the tuner video signal. The NTSC chrominance signal supplied from the line-in jack must be 4.43 MHz NTSC chroma signal because the chrominance recording circuit is not provided with the normal (3.58 MHz) NTSC frequency conversion circuit.

A peaking circuit is provided before the audio preamplifer and it boosts the high frequency band of the reproduced audio signal to compensate loss caused by the audio head in the high frequency band. As the frequency response of the loss varies according to the tape speed, the frequency to be boosted must be switched according to the selected colour system. When "Lo" is applied to pin 18 of audio processor **IC401** in the NTSC mode, as switch S3 in the IC turns off to disconnect C451, the resonance frequency of the peaking circuit consisting of the audio head and C401 is shifted to the higher frequency.

The operation of chroma processor **IC301** and the **servo sub P.C.B** will be described in sections 1-2 and 1-4.

1-2 Switching of Chroma processor

Fig. 1-2 is a simplified block diagram of the chroma playback circuit. When "Hi" is applied to pin 8 of chroma processor IC301 and Q303, the circuit configuration is switched to that of NTSC. Table 1-1 shows the differences among the PAL, MESECAM and NTSC systems in the playback mode.
When "Hi" is applied to pin 8 in the recording mode, the burst signal to be recorded is enhanced by 6 dB to improve the S/N of the burst signal by the burst emphasis stage in IC301, and is decreased to the original level by the burst deemphasis stage in playback.

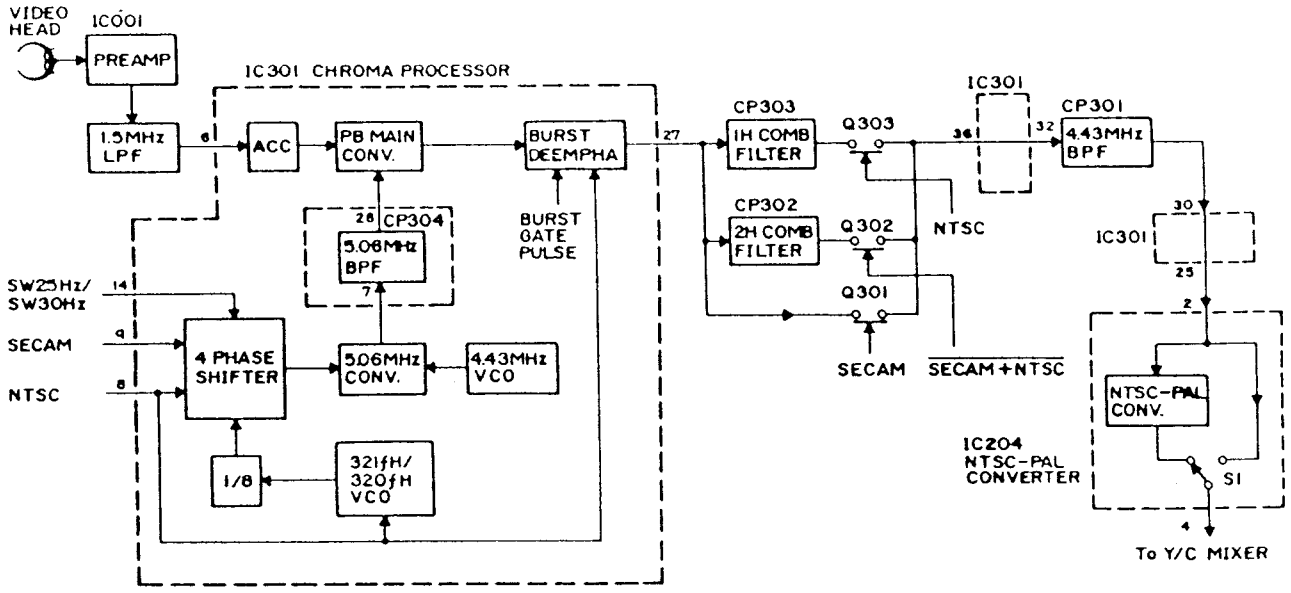


Fig. 1-2 Chroma Playback Circuit

Table 1-1 Differences among PAL, MESECAM and NTSC in Playback

	PAL	MESECAM	NTSC
321fH/320fH VCO	321fH VCO	321fH VCO	320fH VCO
SW25Hz/SW30Hz	SW25Hz	(SW25Hz)	SW30Hz
PHASE ROTATION AT 4-PHASE SHIFTER	CH1: FIXED CH2: -90° EVERY H	FIXED	CH1: +90° CH2: -90° EVERY H
FREQUENCY OF 4-PHASE SHIFTER	(40 + 1/8)fH 627 kHz	(40 + 1/8)fH 627 kHz	40fH 629 kHz
5.06 MHz CONVERTER FREQUENCY	5.060 MHz	5.060 MHz	5.062 MHz
BURST DEEMPHASIS	0 dB	0 dB	-6 dB
COMB FILTER	2H COMB FILTER	NO	1H COMB FILTER

1-3 NTSC to PAL Converter

In this unit, the NTSC playback chrominance signal can be converted to a PAL chrominance signal to enable the signal reproduced from a NTSC recorded tape to be viewed with a PAL monitor TV.
As is known, the R-Y chroma difference signal alternates its phase by 180° every line in the PAL system, but it is fixed regardless of the line in the NTSC system.
Regarding to the burst phase, it alternates between +135° and -135° every line in the PAL system, but it is a constant +180° in the NTSC system.
To reduce the production cost of this unit, the converted chrominance signal is not a regular one, but a quasi-PAL signal.
Fig. 1-3 (e) shows the quasi-PAL chroma signal produced in this unit.
To produce the quasi-PAL signal, the +180° constant burst phase in the NTSC system is alternately converted to +135° and -135° from field to field, and the 4.43 MHz NTSC chroma signal in the horizontal scanning period after the burst signal of -135° phase is deleted.
Fig 1-3 (a) is a block diagram of the NTSC-PAL chrominance signal converter.
In modes other than the NTSC mode, or when colour signal modify switch S302 is set to the "off" position, as IC204 pin 3 is set to "Lo", the chroma signal at pin 2 is selected by switch S4 and is output to the Y/C mixer via playback switch S5 without modification.
When a NTSC recorded tape is played back and colour signal modify switch S302 is set to the "on" position, switch S4 select the PAL chroma signal conveted from the 4.43 MHz NTSC chroma signal and outputs it via playback switch S5.

First the 4.43 MHz NTSC composite chroma signal is applied to switch S1. S1 splits the composite chroma signal into the burst signal and the real chroma signal using the burst gate pulse

supplied via pin 1. During period T1 when the burst gate pulse amplitude is "Hi" (see Fig. 1-3 (c)), S1 separates the burst signal and sents it to the phase shifter stages. During period T2, S1 selects the real chroma signal and sends it to switch S3.

On the other hand, the burst gate pulse is applied to the 1/2 divider, where it is converted to a square pulse with a period of 2H (2 x 63.5 µs).

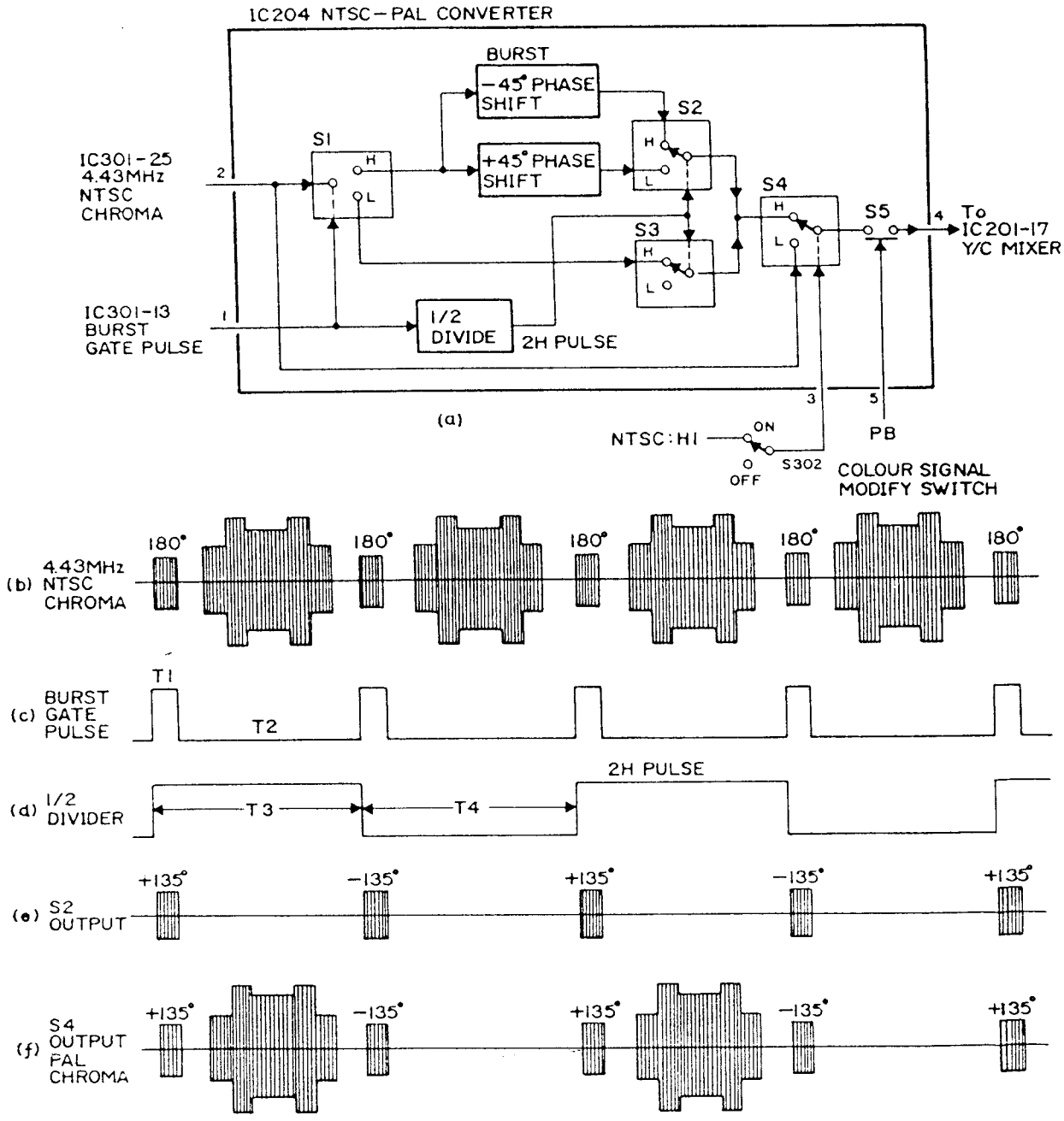


Fig. 1-3 NTSC-PAL Chrominance Signal Converter

The separated burst signal is sent to the phase shifter stages, where it is converted to burst signals with phases of +135° and -135°.

Switches S2 and S3 are switched together by the 2H pulse and combines the burst signal and the real chroma signal to form the PAL composite chroma signal. During period T3 when the 2H pulse is "Hi", S2 selects the burst signal of +135° and S3 selects the real chroma signal consisting of the R-Y and B-Y colour difference signals. During period T4 when the 2H pulse is "Lo", S2 selects the -135° burst signal and S3 blocks the real chroma signal whose R-Y colour difference signal has reverse phase to the regular PAL signal. Thus a quasi-PAL chroma signal is formed by switches S2 and S3, and is then output via switches S4 and S5 to the Y/C mixer stage in luminance processor IC201.

1-4 Configuration of Servo Circuit

Fig. 1-4 shows the configuration of the servo circuit. This unit provides an additional print circuit board designated as servo sub P.C.B. to allow the servo control in both the PAL and NTSC systems. This servo circuit is basically designed to operate for the PAL system. When it operates in the PAL mode, the servo sub P.C.B operates the same as in the normal PAL VTRs. As for the capstan FG signal, the survo sub P.C.B. outputs it without modification, and as for the reference clock signal, it outputs a 4.43 MHz carrier signal to the main servo IC the same as in normal PAL VTRs.

Tables 1-2 and 1-3 show the reference and comparison signals used in the PAL and NTSC servo systems.

In the NTSC system, the cylinder must rotate at 30 Hz while it rotates at 25 Hz in the PAL system. This switching is accomplished by changing the reference signal frequency from 4.43 MHz to 5.32 Hz. As the 5.32 MHz is equal to a multiple of 30/25 times the 4.43 MHz signal, in the NTSC mode, the REF 25Hz generator in the main servo IC601 generates REF 30Hz. As a result, the cylinder phase control loop operates so

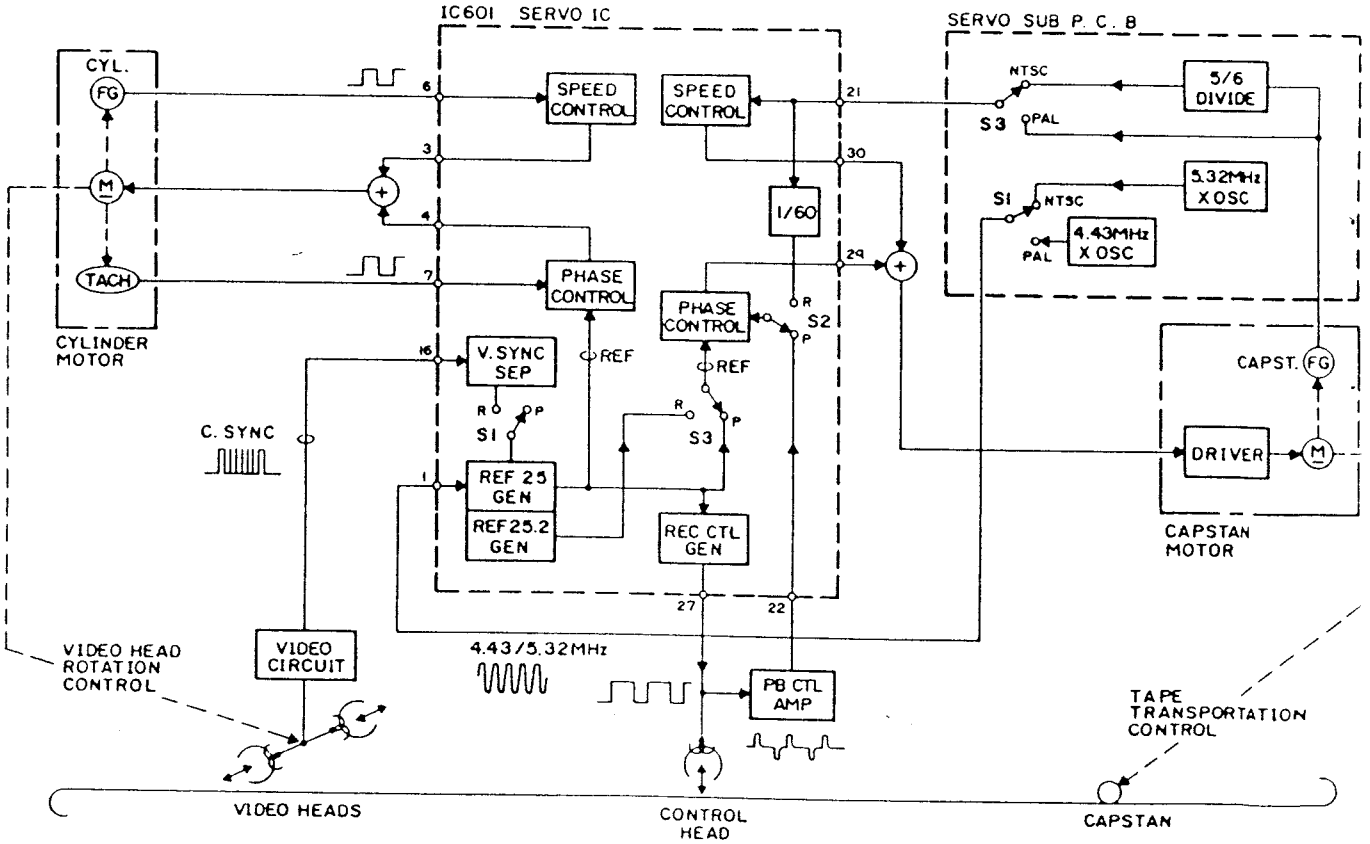


Fig. 1-4 Configuration of Servo Circuit

Table 1-2 Reference and Comparison Signals in PAL Mode

Motor	Control System	Mode	Reference Signal	Comparison Signal
Cylinder	Phase	REC	1/2 V. SYNC	Tach pulse (TACH PULSE: 25 Hz)
		PB	REF25Hz	
	Speed	REC/PB		Cylinder FG (CYL. FG: 300 Hz)
Capstan	Phase	REC	REF25.2Hz	Capstan FG (C. FG: 25.2Hz)
		PB	REF25Hz	Control pulse (CTL PULSE: 25 Hz)
	Speed	REC/PB		Capstan FG (C. FG: 1514 Hz)

Table 1-3 Reference and Comparison Signals in NTSC Mode

Motor	Control System	Mode	Reference Signal	Comparison Signal
Cylinder	Phase	REC	1/2 V. SYNC	Tach pulse (TACH PULSE: 30 Hz)
		PB	REF30Hz	
	Speed	REC/PB		Cylinder FG (CYL. FG: 360 Hz)
Capstan	Phase	REC	REF30.3Hz	Capstan FG (C. FG: 30.3Hz)
		PB	REF30Hz	Control pulse (CTL PULSE: 30 Hz)
	Speed	REC		Capstan FG (C. FG:2180 x 5/6=1817) (SP: 1817 Hz)
		PB		Capstan FG (C. FG:2159 x 5/6=1799) (SP: 1799 Hz)

NTSC capstan FG rated fraquency: 2159 Hz
NTSC capstan FG nominal frequency: 2160 Hz

as to lock the TACH pulse (cylinder rotation phase) to REF 30Hz, and the cylinder rotates at 30 Hz.

As for the playback tape speed, the tape must run at 33.35 mm/sec and the playback CTL frequency must be 30 Hz in the NTSC mode, while in the PAL mode the tape speed is 23.39 mm/sec and the playback CTL frequency is 25 Hz.
The switching of tape speed is also accomplished by switching the reference clock frequency.
In the NTSC mode, as the reference clock is switched to 5.32 MHz from 4.43 MHz in the servo sub P.C.B and the REC 25Hz generator in IC601 generates 30 Hz, the capstan phase control roop acts so that the PB CTL becomes 30 Hz and the playback tape speed becomes 33.35 mm/sec.

The capstan speed control stage in IC601 measures the period of the capstan FG signal using the clock pulse (fREF/3) derived from the reference clock signal fREF (fREF: 4.43 MHz in PAL, 5.32 MHz in NTSC), and regulates the speed control voltage so that the capstan FG frequency is 1515 Hz in the PAL mode.

In the NTSC mode, the capstan speed control stage must act so that the tape speed becomes 33.35 mm/sec. In this case, as the capstan FG frequency is proportional to the tape speed, the capstan FG frequency becomes 2160 Hz.
To make the capstan speed control stage operate normally with the NTSC capstan FG frequency of 2160 Hz, the 2160 Hz capstan FG signal is divied by the 5/6 divider in the servo sub P.C.B circuit to become 1800 Hz, and is applied to the capstan speed control stage. The capstan speed control stage also accepts the clock pulse derived from the 5.32 MH reference clock. In this case the speed control stage looks the 1800 Hz as 1500 Hz, because the period of clock pluse (fREF/3) derived from 5.32 MHz is 5/6 times that of the 4.43 MHz reference clock used in the PAL mode. And the stage regulates its output voltage so that the incoming FG frequency becomes 1818 Hz. When the capstan FG frequency at the input of the capstan speed control stage is 1818 Hz, the original capstan FG

frequency is 2182 Hz, which is higher than the rated frequency by 1%.

Thus the capstan speed control stage sets the tape speed to a speed in the vicinity of 33.35 mm/sec. If the capstan speed is within the error range of ±5% centred on the rated speed, the capstan phase control loop locks-in the capstan speed to the rated speed.

However in the NTSC recording mode, as the reference signal for the capstan phase control is 30.3 Hz, the comparison capstan FG signal frequency is locked-in to 30.3 Hz. So the capstan FG frequency at pin 21 of servo IC601 is set to 1818 Hz and the original FG frequency is set to 2181 Hz. 2181 Hz is higher by approximately 1% than the nominal NTSC capstan FG freqency of 2160 Hz. As a results, in this unit, the NTSC recording tape speed is set to a value 1% faster than the normal speed.

1-5 5/6 Capstan FG Divider

Fig. 1-5 shows the circuit configuration of the 5/6 capstan FG divider.

In the PAL mode, the capstan FG signal is passed through switch S3 in IC1605 and sent to main servo IC601 via pin 14 (3.6 Vp-p) without any processing.
In the NTSC mode, the capstan FG signal is divided by 6/5 by the divider consisting of IC1602 and IC1603 and then output via IC1605 to the capstan servo circuit in IC601.

The phase comparator, voltage controlled oscillator (VCO) and 5-divider form a PLL oscillator and the VCO stage generates a signal 5 times the input capstan FG frequency. The phase comparator stage accepts the capstan FG signal via pin 14 and amp A1, and the output of the 5-divider via pin 3, then compares the phase of two input signals to produce a DC control voltage in proportion to the phase difference of the two input signals. The DC control voltage is smoothed by the lowpass filter connected between pins 13 and 9, and is applied to the VCO stage to regulate and set the oscillation frequency to 5 times the input FG frequency.

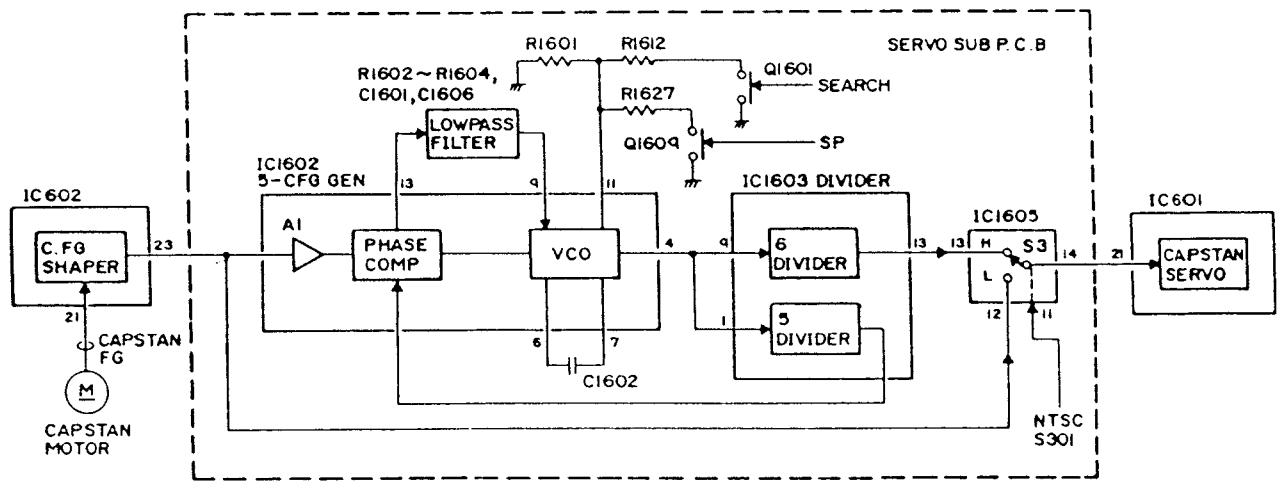


Fig. 1-5 5/6 Capstan FG Divider

The 5-CFG signal generated by the VCO is applied to the 6-divier in IC1603, where it is divided by 6 to become a signal having a frequency of 5/6 the capstan FG frequency. The output of the 6-divider is applied to main servo IC601 via PAL/NTSC switch IC1605.

The free-running frequency of the VCO stage depends on the capacitor connected between pins 6 and 7, and the resistor attached at pin 11. The capstan FG frequency is 5 times that of the normal speed in the search mode, and it is 3 times that of the EP speed when the tape speed is SP. (EP speed is not provided in this unit) To match the free-running frequency to that of the input FG frequency at the various speeds, the resistance attached to pin 11 is switched. In the SP mode Q1609 turns on, and in the search mode Q1601 turns on to enhance the free-running frequency of the VCO.

1-6 Switching of Servo Circuit

Fig 1-6 shows the PAL/NTSC servo switching circuit.
When the NTSC position is selected by colour system select switch S301-1, as "Hi" is applied to pins 9 and 10 of PAL/NTSC select switch IC1605, switches S1 and S2 select the NTSC position and pins 3 and 1 of the IC output "Hi" to activate the NTSC circuits. When pin 3 is "Hi", the DC power is supplied to Q1602 to make it generate the 5.32 MHz reference clock signal. In this case, as Q1603 receives a proper bias voltage via R1628, Q1603 becomes conducting and outputs the 5.32 MHz reference clock to main servo IC601. In the PAL mode, Q1604 generates the 4.43 MHz reference clock and outputs it via Q1605.

When the mode of operation is NTSC and pin 2 is "Lo" (pin 1 is "Hi"), Q1606 turns on and switches the timing of the head switching pulse and the tracking to correspond to NTSC. The timing of the head switching pulse (SW30Hz) is determined by the charge current flowing through Q606, R1617, D1608, R1618 and RT601 to C606.
To match the position of the video heads and video tracks, that is to match the

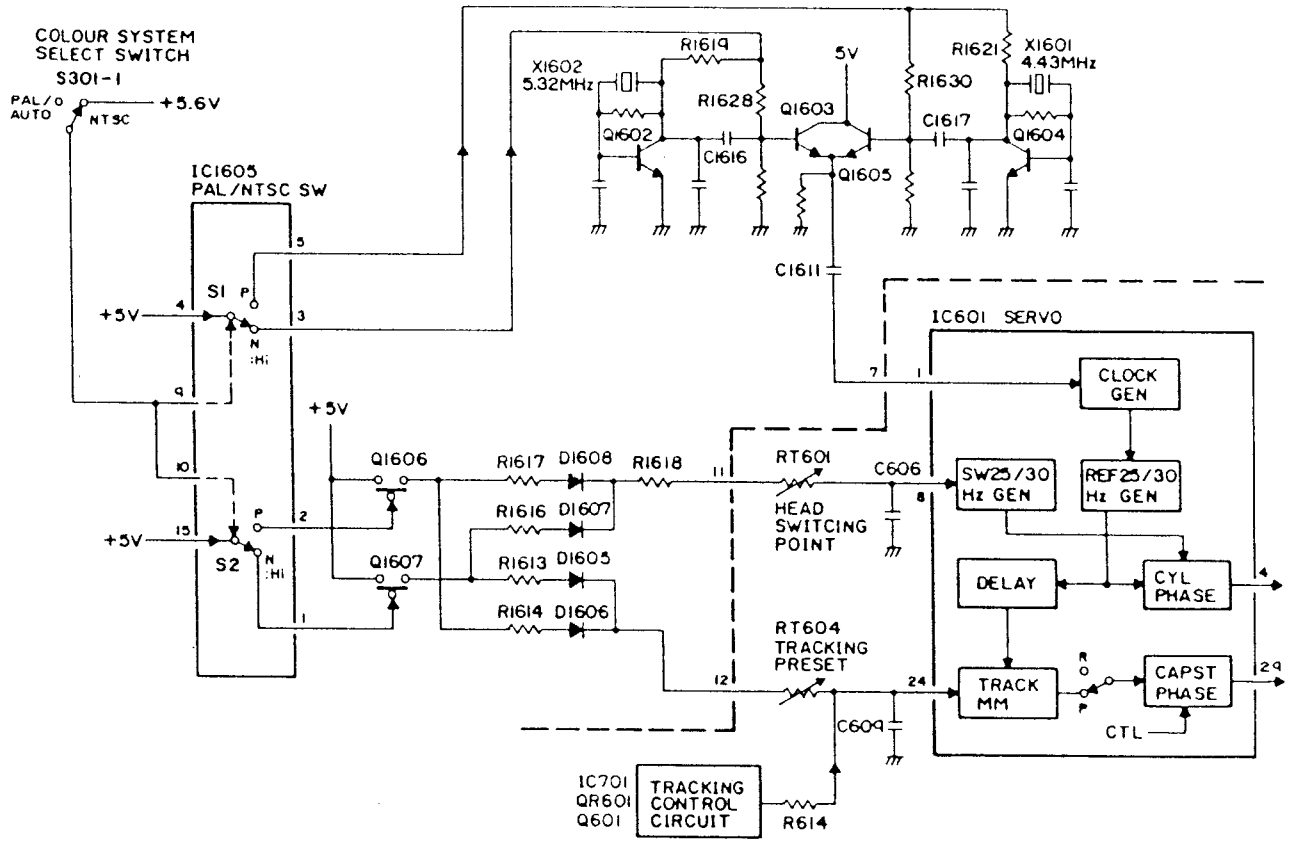


Fig. 1-6 Servo Switching Circuit

cylinder phase and the tape position, the reference signal (REF25Hz or REF30Hz) to be supplied to the capstan phase control circuit is delayed by the internal delay circuit and the external tracking monostable multivibrator. The optimum delay time of the tracking monostable multivibrator is different depending on the system, NTSC or PAL. The delay time of the monostable multivibrator is determined by the charge current flowing to C609 attached at pin 24.
R1614 and R1613 respectively specify the delay time in the NTSC and PAL modes.
The tracking control circuit consisting of IC701, QR601 and Q601 is an ordinary tracking control circuit, which can be controlled by the user to regulate the delay time using the remote control hand unit.

frequency is 2182 Hz, which is higher than the rated frequency by 1%.

Thus the capstan speed control stage sets the tape speed to a speed in the vicinity of 33.35 mm/sec. If the capstan speed is within the error range of ±5% centred on the rated speed, the capstan phase control loop locks-in the capstan speed to the rated speed.

However in the NTSC recording mode, as the reference signal for the capstan phase control is 30.3 Hz, the comparison capstan FG signal frequency is locked-in to 30.3 Hz. So the capstan FG frequency at pin 21 of servo IC601 is set to 1818 Hz and the original FG frequency is set to 2181 Hz. 2181 Hz is higher by approximately 1% than the nominal NTSC capstan FG freqency of 2160 Hz. As a results, in this unit, the NTSC recording tape speed is set to a value 1% faster than the normal speed.

1-5 5/6 Capstan FG Divider

Fig. 1-5 shows the circuit configuration of the 5/6 capstan FG divider.

In the PAL mode, the capstan FG signal is passed through switch S3 in IC1605 and sent to main servo IC601 via pin 14 (3.6 Vp-p) without any processing.
In the NTSC mode, the capstan FG signal is divided by 6/5 by the divider consisting of IC1602 and IC1603 and then output via IC1605 to the capstan servo circuit in IC601.

The phase comparator, voltage controlled oscillator (VCO) and 5-divider form a PLL oscillator and the VCO stage generates a signal 5 times the input capstan FG frequency. The phase comparator stage accepts the capstan FG signal via pin 14 and amp A1, and the output of the 5-divider via pin 3, then compares the phase of two input signals to produce a DC control voltage in proportion to the phase difference of the two input signals. The DC control voltage is smoothed by the lowpass filter connected between pins 13 and 9, and is applied to the VCO stage to regulate and set the oscillation frequency to 5 times the input FG frequency.

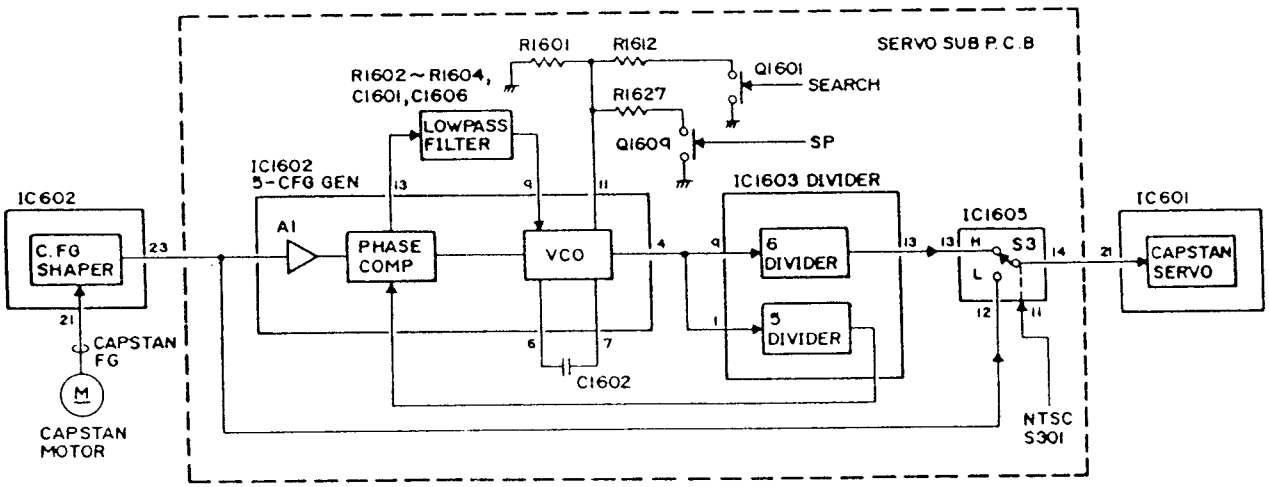


Fig. 1-5 5/6 Capstan FG Divider

The 5-CFG signal generated by the VCO is applied to the 6-divier in IC1603, where it is divided by 6 to become a signal having a frequency of 5/6 the capstan FG frequency. The output of the 6-divider is applied to main servo IC601 via PAL/NTSC switch IC1605.

The free-running frequency of the VCO stage depends on the capacitor connected between pins 6 and 7, and the resistor attached at pin 11. The capstan FG frequency is 5 times that of the normal speed in the search mode, and it is 3 times that of the EP speed when the tape speed is SP. (EP speed is not provided in this unit) To match the free-running frequency to that of the input FG frequency at the various speeds, the resistance attached to pin 11 is switched. In the SP mode Q1609 turns on, and in the search mode Q1601 turns on to enhance the free-running frequency of the VCO.

1-6 Switching of Servo Circuit

Fig 1-6 shows the PAL/NTSC servo switching circuit.
When the NTSC position is selected by colour system select switch S301-1, as "Hi" is applied to pins 9 and 10 of PAL/NTSC select switch IC1605, switches S1 and S2 select the NTSC position and pins 3 and 1 of the IC output "Hi" to activate the NTSC circuits. When pin 3 is "Hi", the DC power is supplied to Q1602 to make it generate the 5.32 MHz reference clock signal. In this case, as Q1603 receives a proper bias voltage via R1628, Q1603 becomes conducting and outputs the 5.32 MHz reference clock to main servo IC601. In the PAL mode, Q1604 generates the 4.43 MHz reference clock and outputs it via Q1605.

When the mode of operation is NTSC and pin 2 is "Lo" (pin 1 is "Hi"), Q1606 turns on and switches the timing of the head switching pulse and the tracking to correspond to NTSC. The timing of the head switching pulse (SW30Hz) is determined by the charge current flowing through Q606, R1617, D1608, R1618 and RT601 to C606.
To match the position of the video heads and video tracks, that is to match the

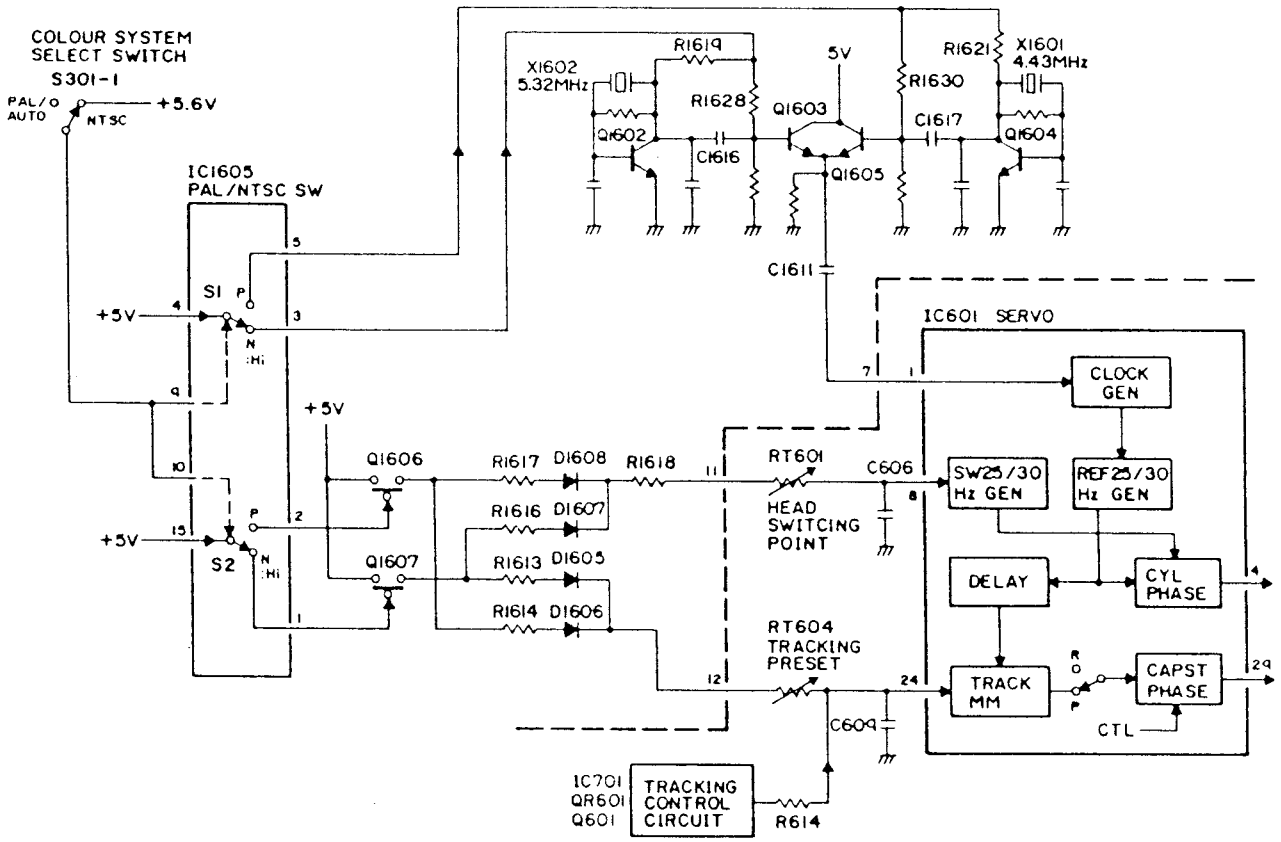


Fig. 1-6 Servo Switching Circuit

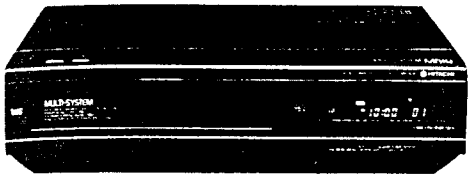
cylinder phase and the tape position, the reference signal (REF25Hz or REF30Hz) to be supplied to the capstan phase control circuit is delayed by the internal delay circuit and the external tracking monostable multivibrator. The optimum delay time of the tracking monostable multivibrator is different depending on the system, NTSC or PAL. The delay time of the monostable multivibrator is determined by the charge current flowing to C609 attached at pin 24.
R1614 and R1613 respectively specify the delay time in the NTSC and PAL modes.
The tracking control circuit consisting of IC701, QR601 and Q601 is an ordinary tracking control circuit, which can be controlled by the user to regulate the delay time using the remote control hand unit.

HITACHI

SERVICE MANUAL

TK | No.3038E

VT-M619EM(DS,GK)



Technical Data

SPECIFICATIONS

Format:	VHS PAL Standard
Recording:	Rotary Two-Head Helical Scan Azimuth Recording
Tape Speed:	23.39mm/sec.
Tape Width:	12.7mm
Operation Temperature:	5°C to 40°C
Video:	PAL colour (system B/G and I) and SECAM colour (system B/G)–VT-M619EM(DS) PAL colour (system B/G and D/K) and SECAM colour (system B/G and D/K)–VT-M619EM(GK)
Recording Time:	240 min. (with E-240 cassette)
Aerial Input:	VHF low channels 2–4 (48.25–62.25MHz) VHF high channels 5–12, CATV channels S1–S20 (105.25–294.25MHz) UHF channels 21–69 (471.25–855.25MHz)
RF Output:	UHF channels 37 (30–39 adjustable)–(System G or I): VT-M619EM(DS) –(System G or K): VT-M619EM(GK)
Video Input:	0.5 to 1.5V p-p 75 ohm Unbalanced
Video Output:	1V p-p 75 ohm Unbalanced
S/N Ratio (Video):	43dB
S/N Ratio (Audio):	43dB
Horizontal Resolution:	Colour 260 lines
Audio Input:	–8dBm 10 Kohm
Audio Output:	–8dBm 1 Kohm
Audio Frequency Range:	70Hz to 12kHz
Fast Forward/Rewidn Time:	About 7 minutes (with E-240 cassette)
Power:	AC100–110V, 115–127V, 200–220V, 230–250V, 50/60Hz
Power Consumption:	24W (including timer)
Timer:	12 hour digital indication
Cabinet Size:	370mm(W)×99mm(H)×264mm(D)
Weight:	6.6kg
Accessory Included:	1 – Aerial cable 1 – Infrared remote control unit 2 – Batteries 1 – Mains plug adaptor

* Design and specifications are subject to change without notice.

VHS

This video deck is a VHS type video recorder. For proper operation, only the VHS type cassette must be used.

Manuals related to the VT-M619EM (DS, GK)

Name of Manual	Language	Manual No.	Chapters included
Technical Data	English	3038E	Chapter 1-6
Technical Information	English	3039E	–

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

VIDEO CASSETTE RECORDER

April 1989 TOKAI WORKS

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SCHEMATIC DIAGRAM | CIRCUIT BOARD

	SCHEMATIC DIAGRAM	CIRCUIT BOARD
RF CONVERTER	5- 5	—
TUNER/IF (For DS)	5- 6	—
TUNER/IF (For GK)	5- 8	—
CHROMA	5-10	5-11
PRE/REC AMP	5-11	—
Y	5-12	5-23
CAPSTAN MOTOR	5-14	—
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SAFETY PRECAUTIONS

The following precautions should be observed when servicing.

1. Since many parts in the unit have special safety-related characteristics, always use genuine Hitachi replacement parts. Especially critical parts in the power circuit block should not be replaced with other makers' parts! Critical parts are marked ⚠ in the schematic diagrams.
2. Before returning a repaired unit to the customer, the servicing technician must thoroughly test the unit to assertain that it is completely safe to operate without danger of electrical shock.

COMPARISON WITH CONVENTIONAL MODEL

ITEM	VT-M619EM(DS)/(GK)	VT-498EM
FEATURES		
HQ(High Quality)	PROVIDED	PROVIDED
TUNING SYSTEM	VOLTAGE SYNTHESIZER (AUTO TUNING)	VOLTAGE SYNTHESIZER (AUTO TUNING)
TIMER RECORDING	4 PROG./1 YEAR	8 PROG./1 YEAR
TIMER BACK-UP	NOT PROVIDED	PROVIDED(5min.)
INSTANT RECORDING TIMER	PROVIDED	PROVIDED
AUTO REWIND	PROVIDED	PROVIDED
MEMORY STOP	PROVIDED	PROVIDED
REWIND SHUT OFF	PROVIDED	PROVIDED
SLOW TRACKING	NOT PROVIDED	PROVIDED
EDIT SWITCH	PROVIDED	PROVIDED
PICTURE CONTROL	NOT PROVIDED	PROVIDED
TRICK PLAY		
· VISUAL SEARCH	PROVIDED	PROVIDED
· STILL/PAUSE	PROVIDED	PROVIDED
· F.ADV	NOT PROVIDED	PROVIDED
· SLOW	NOT PROVIDED	PROVIDED
· REPEAT	NOT PROVIDED	PROVIDED
· FAST	NOT PROVIDED	PROVIDED
CHASSIS		
BASIC CHASSIS TYPE	Z	Z
CYLINDER MOTOR	THREE PHASE OUTER ROTOR FG:300Hz	THREE PHASE OUTER ROTOR FG:360Hz
VIDEO HEADS	2HEAD SP:+57μm/−57μm	4HEAD SP:+65μm/−65μm EP/LP:+30μm/−30μm

COMPARISON OF MAIN CONTROL ICs

ITEM	VT-M619EM(DS)/(GK)	VT-498EM
VIDEO		
Y PROCESS	HT4947C (IC201)	HT4867 (IC201)
DO/NOISE REDUCTION	———	HT4848B (IC202)
CLOCK GENE.	NJM2223D (IC202)	———
CCD 1H DELAY LINE	MSM6965R (IC203)	HT4664A (IC203)
PB CHROMA GEN	HES8081B (IC204)	———
DETAIL ENHANCE	———	HA11888 (IC204)
CLOCK SW	———	LA7016 (IC205)
Y SW	———	LA7016 (IC207)
SECAM DETECT.	BA7025L (IC351)	BA7025L (IC271)
CHROMA PROCESS	HES8463A (IC301)	HA11756 (IC301)
BPF SW	———	HES8033A (IC302)
SECAM REC SW	———	HES8015 (IC304)
fsc SW	———	LC4066SIP (IC305)
SECAM CHROMA PROCESS	———	TME021B (IC371)

ITEM	VT-M619EM(DS)/(GK)		VT-498EM	
AUDIO				
HEAD SW	———		BA7755	(IC401)
AUDIO MAIN PROCESS	LA7295	(IC401)	BA7751ALS	(IC402)
JACK				
AUDIO LINE/TUNER SW	———		LA7016	(IC403)
VIDEO LINE/TUNER SW	HES8053	(IC1501)	LA7016	(IC461)
TUNING				
TUNING CONTROL	LA7936	(IC801)	LA7935	(IC801)
EAROM	CXK1013P	(IC903)	———	
BUFFER	———		NJM2903	(IC802)
TUNER INPUT SW	———		μPD4066	(IC803)
SERVO				
MAIN SERVO PROCESS	BU2745S	(IC601)	HD49719NT	(IC601)
PULSE GENERATOR	———		M54874P	(IC602)
CYLINDER MOTOR DRIVE	LB1624D	(IC603)	HA13403VA	(IC603)
SWITCH	BU4053	(IC1605)	BU4053B	(IC604-IC607)
CAPST. SPEED ERROR DET.	———		BA6303	(IC608)
AMP	LA7116	(IC602)	———	
PHASE COMPARATOR	HD14046	(IC1602)	———	
COUNTER	HD14520	(IC1603)	———	
SYSTEM CONTROL				
SYSTEM CONTROL μP	CXP5058-175	(IC701)	HD614088SC19	(IC901)
LOADING MOTOR DRIVE	BA6209U4	(IC902)	BA6209	(IC902)
BUFFER	BA6993	(IC901)	BA6993	(IC903)
V. SYNC SEPARATOR	———		HT4603	(IC951)
TIMER				
TIMER μP	CXP5058-175	(IC701)	M50954-672SP	(IC701)
EAROM	———		M58630P	(IC702)
RESET	———		S8053ALB	(IC703)
REGULATOR				
MULTI REGULATOR	———		STR5372H	(IC851)
12V REGULATOR	M5F78L12	(IC853)	———	
12V REGULATOR	M5F78L12	(IC1502)	———	
5V REGULATOR	M5F7805	(IC1504-IC1505)	———	

FEATURE

■ **Multi-Colour system: PAL, MESECAM, NTSC4.43**
This VT-M619EM(DS)/VT-M619EM(GK) records and playbacks tapes of following colour systems.

Recorded tape (SP only)		NTSC	PAL	MESECAM	SECAM
VT-M619EM(DS)	Recording	Yes*	Yes	Yes	NO COLOUR
VT-M619EM(GK)	Playback	Yes**	Yes	Yes	NO COLOUR

*NTSC4.43 system VTR is used, and only for tape to tape transfer.
**NTSC4.43 system TV is used.

■ **COLOUR SIGNAL MODIFIED SWITCH**
To watch NTSC tapes, Multi-system TV is to be used with VT-M619EM. However as an exceptional case, **with PAL colour TV providing vertical sync. adjustment circuitry (or volume) for 60Hz, NTSC tapes may be watched by COLOUR SIGNAL MODIFIED SWITCH on.** (NTSC tape cannot be watched with PAL colour TV having no vertical sync. adjustment circuitry (or volume) for 60Hz.)

■ **Voltage sythesized Dual Tuner**
This VT-M619EM(DS)/VT-M619EM(GK) records and playbacks TV programmes of following TV broadcasting system.

Broadcasting System		B/G-PAL	I-PAL	D/K-PAL	B/G-SECAM	D/K-SECAM	M-NTSC	L-SECAM
VT-M619EM (DS)	Recording	Yes	Yes	No	Yes	No	No	No
	Playback	Yes	Yes	Yes*	Yes	Yes*	No	NO COLOUR*
VT-M619EM (GK)	Recording	Yes	No	Yes	Yes	Yes	No	No
	Playback	Yes	Yes*	Yes	Yes	Yes	No	NO COLOUR*

*Playback signal from video/audio output jack only.

■ **Dual RF Converter**
- for connection to multi-system TV or B/G-PAL/SECAM TV or I-PAL TV. – VT-M619EM(DS).
- for connection to multi-system TV or B/G-PAL/SECAM TV, or D/K-PAL/SECAM TV. – VT-M619EM(GK).

■ **4 Programme-365 day-Calendar Quartz Timer (Diary/Weekly Repeat included).**

■ **13 Button/15 Function Remote Control Handset (Supplied accessory)**

■ **As an optional accessory, LCD-Panel Timer-programmable Remote Control Handset (HITACHI VT-RM551E) is compatible.**

■ **Simulcast recording capability.**

■ **Instant Recording Timer.**

■ **Auto operation (Auto operate on, Auto play, Auto tape canceller, Auto Rewind, Rewind Auto Shut off, Operate off eject).**

■ **Edit start for recording start after interrupting the recording.**

■ **Edit switch for improving picture quality in tape to tape transfer.**

■ **Power Supply:** 100-110V, 115-127V, 200-220V, 230-250V, 50/60Hz.

■ **SP mode Recording/Playback**
- PAL/MESECAM: max. 4 Hours, and NTSC4.43: max. 2 Hours 40 min.
- LP mode/EP mode are not operational.

■ **This Model is most suitable to use with Multi-system TV (for examples HITACHI CMT-3300, CMT-2900, CMT-2700, CMT-2139, or CMT-1435.)**

HOW TO ENJOY THIS MULTI-SYSTEM VIDEO DECK

There are various colour broadcasting systems in different parts of the world. Your TV set can receive TV broadcast in your area, but perhaps cannot receive colour broadcasts in other countries. There are tapes recorded with different colour broadcast systems. Use this unit after fully understanding the following.

• **Types of tape playable with VT-M619EM(DS)/VT-M619EM(GK) and TV set to be connected** Table 1

		TV system								
		B/G-PAL colour TV	I-PAL colour TV	D/K-PAL colour TV	B/G-SECAM colour TV	D/K-SECAM colour TV	L-SECAM colour TV	NTSC 3.58MHz colour TV	NTSC 4.43MHz colour TV	Multi system colour TV (for examples HITACHI CMT-3300/2900/2700/2139/1435)
VT-M619EM (DS) playback mode	PAL	YES	YES	YES*						YES
	MESECAM				YES	YES*	NO* Colour			YES
	SECAM (French SECAM)				NO* Colour	NO* Colour	NO* Colour			NO* Colour
	NTSC								YES	YES
VT-M619EM (GK) playback mode	PAL	YES	YES*	YES						YES
	MESECAM				YES	YES	NO* Colour			YES
	SECAM (French SECAM)				NO* Colour	NO* Colour	NO* Colour			NO* Colour
	NTSC								YES	YES

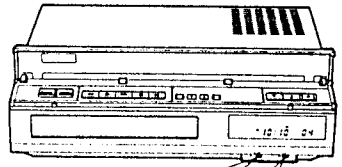
*Playback signal from Video/audio out jack only.

• *Broadcast systems that can be recorded with VT-M619EM(DS)/VT-M619(GK)* **Table 2**

Broadcasting system for colour TV		B/G-PAL	I-PAL	D/K-PAL	B/G-SECAM	D/K-SECAM
Major Countries		Australia West Germany Kuwait India Italy Singapore U.A.E. Malaysia	Great Britain Hong Kong	China Mongolia	Saudi Arabia Greece Lebanon Morocco G.D.R Egypt	Bulgaria Ivory coast U.S.S.R Hungary Czechoslovakia Poland Rumania
VT-M619EM(DS) Recording mode	PAL	YES	YES			
	MESECAM				YES	
VT-M619EM(GK) Recording mode	PAL	YES		YES		
	MESECAM				YES	YES

• **Before operating**

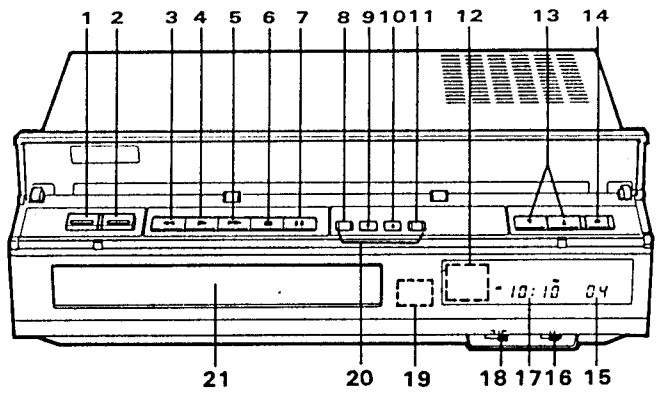
To enjoy the multi-system Video deck, you must change over the system switches as follows.



Colour system select switch
PAL/MESECAM: Normally set to this position for recording and playback a PAL or MESECAM signal.
COLOUR: When recording a PAL or MESECAM signal in an area far from broadcasting station, the recorded picture may lose colour. In this case, set this switch to this position in recording and playback.
NTSC4.43: Set this position when playing an NTSC recorded tape.
Note: If you set to this position during recording, VTR select the "AU" position automatically.

COLOUR SIGNAL MODIFIED switch
Used when playing an NTSC recorded tapes.
ON: Set to this position when connecting this VTR to a PAL colour TV providing vertical sync adjustment circuitry (or volume) for 60Hz.
OFF: Set to this position when connecting this VTR to a Multi system colour TV (for examples HITACHI CMT-3300, CMT-2900, CMT-2700, CMT-2139, or CMT-1435).
Notes:
- The picture shrinks in the vertical direction.
- If the picture flows, adjust the vertical sync control of the TV.
- Colour disappears in the visual search mode.
- It is not possible to record an NTSC signal.

CONTROLS AND FUNCTIONS



1. OPERATE switch
Turn system power on and off.

2. STOP/EJECT button
If this button is pressed, while the set is operating, the running of tape stops and all operating modes are cancelled (except for timer recording). The cassette is ejected, when this button is pressed again in STOP mode.
Note: Power may be on or off when removing the cassette.

3. REW (rewind) button
Press to start rewind.
Press this button during playback and reverse playback picture can be viewed at high speed.

4. PLAY button
Note: When a cassette (with its erase prevention tab removed) is loaded, the playback starts automatically.

5. F.FWD (fast forward) button
Press to activate fast forward.
Press this button during playback and forward playback picture can be viewed at high speed.

6. STOP button
If this button is pressed, while the set is operating, the running of tape stops and all operating modes are cancelled (except for timer recording).
Note: The cassette is ejected, when this button is pressed in STOP mode.

7. PAUSE button
Press to pause during recording.
Press to view a still picture during playback.
Press again to release.

8. PROG/PRESET button
Used for setting channels and for setting clock/timer.

9. Counter Reset button
Press to reset the tape counter to "0000".

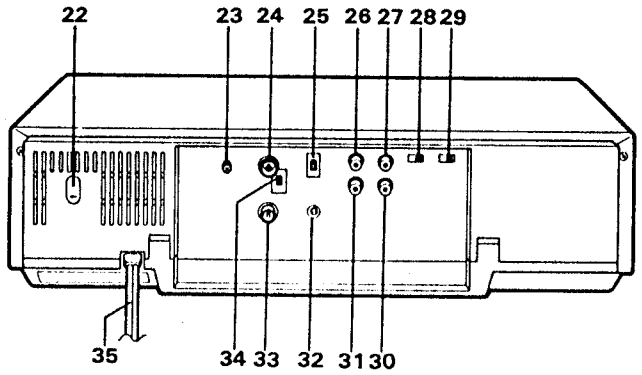
10. Clock/Counter select button
- Press to switch between the clock display and the tape counter display when the OPERATE switch is turned on.
- Press to switch between the clock display and the date display when the OPERATE switch is turned off.

11. SC (simulcast) button
Press the STOP and SC buttons simultaneously, and the SC indicator will appear in the display. In this mode the VTR will record the video from the built-in tuner and the audio from the AUDIO IN jack on the back of VTR.

12. Indicators
- "⊙" appears when a cassette is in the compartment.
- "REC" appears during the record mode.
- "OPE." appears when the VTR is turned on.
- " ▷ " appears during the playback mode.
- " ◁◁ " appears during the rewind mode and flashes during the rewind visual search mode.
- " ▯▯ " appears during the play/record pause mode.
- " ▷▷ " appears during the fast forward mode and flashes during the forward visual search mode.

13. CHANNEL/TRACKING buttons
Select the TV programmes you wish to view or record by pressing these buttons.
You can also select the "AU" position* by pressing these buttons to record or watch the programme input via the AUDIO IN and VIDEO IN jacks.
* The "AU" position is located in the TV station No.91.
These buttons work as the TRACKING buttons and minimize noise in the picture when the VTR is playing back a tape.

14. REC/IRT button
Press this button once to start recording.
Pressing again lets you select a recording time within 4 hours. After recording for the preset time, the VTR will automatically shut off. This is convenient when you go out during recording.



15. TV station number display
This shows the TV station number corresponding to the station selected.

16. COLOUR SIGNAL MODIFIED switch
Used when playing an NTSC recorded tapes.
ON: Set to this position when connecting this VTR to a PAL colour TV providing vertical sync adjustment circuitry (or volume) for 60Hz.
OFF: Set to this position when connecting this VTR to a Multi system colour TV (for examples HITACHI CMT-3300, CMT-2900, CMT-2700, CMT-2139, or CMT-1435).

17. Digital display
This shows the time with a 12-hour display and also shows the tape position. Use the Clock/Counter select button to switch the display between time indication and counter indication.

18. Colour system select switch
PAL/MESECAM: Normally set to this position for recording and playback a PAL or MESECAM signal.
COLOUR: When recording a PAL or MESECAM signal in an area far from broadcasting station, the recorded picture may lose colour. In this case, set this switch to this position in recording and playback.
NTSC 4.43: Set this position when playing an NTSC recorded tape.
Note: If you set to this position during recording, VTR select the "AU" position automatically.

19. Infared ray receiving section
Receives infrared rays from the remote control unit.

20. Clock/timer/channel preset buttons

21. Cassette compartment
Insert a cassette through the door, and loading will be completed automatically.
Note: Power is turned on automatically when a cassette is loaded.

22. Voltage Selector

23. Vertical sync. adjustment control
If you see vertical shaking on the TV screen in the still playback mode, rotate this control to minimize shaking.

24. AERIAL input socket
Connect an external aerial.

25. TSG ON/OFF switch
Set to ON and check that the video channel of your TV set is correct. After setting, set this switch to OFF.

26. AUDIO IN
Receives audio signals from a camera, external sound equipment or from another VTR.

27. VIDEO IN
Receives video signals from a camera, or another VTR.

28. RF converter select switch
Set this switch to match your TV.

29. EDIT SWITCH
Turn this switch on when using this VTR for playback during dubbing. The dubbed tape will provide clearer pictures. This function does not work when using this VTR for recording.

30. VIDEO OUT
Permits video connection of your unit to a TV receiver or another VTR.

31. AUDIO OUT
Permits audio connection of your unit to a TV receiver or another VTR.

32. RF CHANNEL control
Turn TSG ON/OFF switch to "ON" and rotate this control to tune correctly to the video channel.

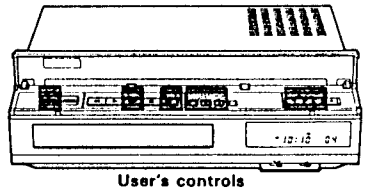
33. RF OUT
Connect to TV aerial input.

34. Attenuator switch
Generally set to the OFF position.
Set to "ON" when interference occurs in an area with a strong signal.

35. Mains lead

PRE-TUNING OF BUILT-IN TV TUNER

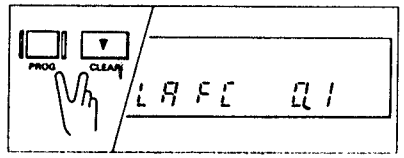
This VTR incorporates a complete television tuner with the required tuning controls. Once you have pre-tuned to preferred stations, you can select any of them by merely pressing the CHANNEL button.



User's controls

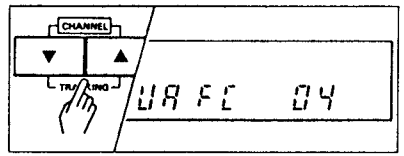
1 Turn on the Operate switches of the VTR and the TV, then set the TV to the pre-tuned video channel.

2 Pres the PROG (PRESET) and CLEAR (TUNING) buttons simultaneously.
Note: Be sure to press both buttons simultaneouly. If you press one before pressing the other, the display will not change to a band indication.



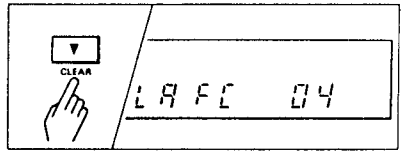
The display indication changes from the clock time display to the band indicator display.

3 Press the CHANNEL button on the VTR to select the station number to be memorized.



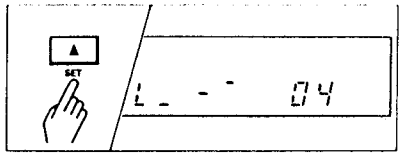
For example, the above diagram shows that the station number 4 has been selected.
Notes:
1. Station numbers "00" through "90", "AU", and "92" through "99" can be now selected consecutively by pressing the CHANNEL button (either up or down). In this case, you can use any station number.
2. When "AFC" is not indicated in the display, press the PAUSE (AFC OFF) button to display "AFC".

4 Press the CLEAR (BAND) button to select the desired band to be pre-tuned.
If you pre-tune to VHF low stations (2 – 4) and Cable TV stations (S1 and S2), select the indication "L". Select "H" for VHF high stations (5 – 12) and cable TV stations (S3 – S20).
Select "U" for UHF stations (21 – 69).



For example, the above diagram shows that the VHF Low band "L" has been selected.

5 Press and release the SET (SEARCH) button to start tuning.



The built-in tuner starts searching from the lowest to highest frequencies.
At a station that is broadcasting, the picture appears on the TV screen and the display changes to "L A F C" again. If the programme displayed is different from the station to be preset, press the SET (SEARCH) button again.
At the next station, the searching will stop and the new station can be preset. Repeat this until the desired station is reached.

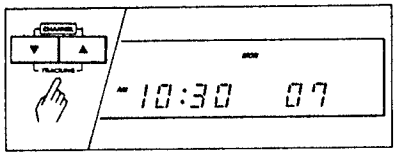
6 Follow the same steps as explained in steps 3 through 5 above for other stations.
You can preset up to 99 stations in memory.

7 After having completed tuning to all required stations, press the PROG (PRESET) button once again.

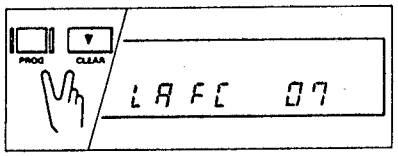
These stations preset in memory as shown in the above can be selected with the CHANNEL buttons on the VTR.

AFC (Automatic Frequency Control)
Since this unit has an AFC circuit, when a station is preset following the above procedure, the AFC turns on automatically and you can receive the signal in optimum condition.
If a TV signal is marginal due to graininess or ghosting, the picture may sometimes be improved by manually tuning for best picture and then defeating the AFC action. To turn AFC off, follow the procedure below.

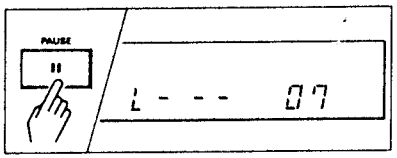
1 Select the desired station by pressing CHANNEL button.



2 Press the PROG (PRESET) and CLEAR (TUNING) buttons simultaneosly.

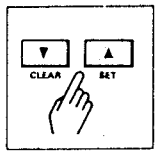


3 Press the PAUSE (AFC OFF) button. "AFC" disappears from the display.



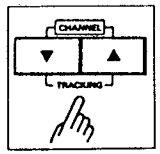
Note: Pressing the button once again will turn the AFC on.

4 Tap on the CLEAR (DOWN) or SET (UP) button alternately for fine tuning.



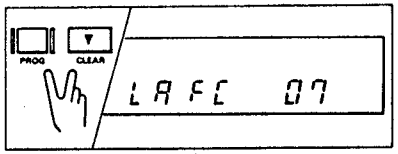
5 Press the PROG (PRESET) button once again.

Programme selection
The programme up and down controls on the VTR let you advance directly to the next higher or lower programmed station.

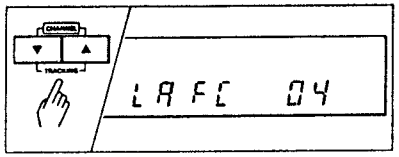


Eliminating unwanted preset stations
You can rearrange the desired stations by eliminating unwanted preset stations for programme up/down tuning.

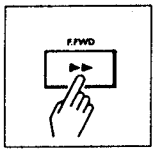
1 Press the PROG (PRESET) and CLEAR (TUNING) buttons simultaneosly.
Note: Be sure to press both buttons simultaneosly. If you press one before pressing the other, the display will not change to a band indication.



2 Press the CHANNEL buttons until an unwanted station is found.



3 Press the F.FWD (SKIP) button once.



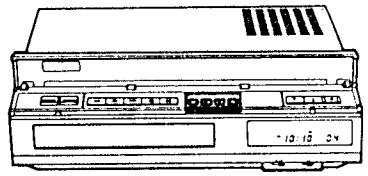
Sound will go off indicating the station has been erased from memory.
Note: Pressing the button once again will restore the erased station.

4 Repeat steps 2 and 3 until all unwanted stations have been erased.

5 After eliminating them, press the PROG (PRESET) button once again.

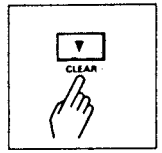
CLOCK TIME SETTING

The built-in digital clock is based on a 12 hour cycle and gives you a constant readout of the time and day.

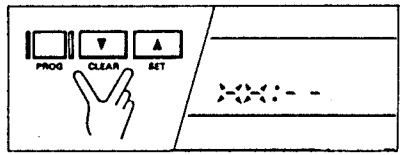


User's controls

- When the MAINS lead is plugged in for the first time, "– –:– –" will appear on the display.
- While you are setting the clock, the display on the VTR will prompt you through the procedure.
- If you enter a wrong digit during setting the clock, press the CLEAR button repeatedly until the incorrect digit flashes, and then enter the correct digit.
- OPERATE switch way be on or off to set the clock.

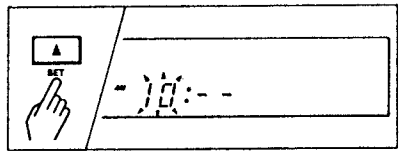


1 Press the PROG (PRESET) and SET (CLOCK) buttons simultaneously.
Note: Be sure press both buttons simultaneosly.



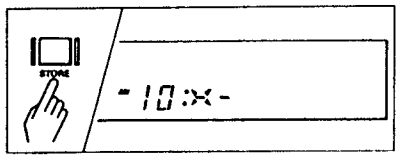
Hour digits start flashing

2 Press the SET button to select the present hour. Hold the button down to advance rapidly.



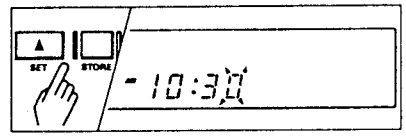
For example, the diagram shows the "AM 10" hour has been selected.

3 Press the STORE button to store the hour.

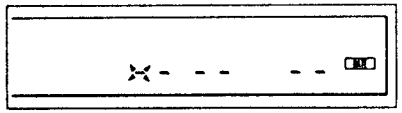


The ten-minute digit starts flashing.

4 Repeat steps 2 and 3 to set minutes. For example, the diagram shows that "30" minutes have been set.

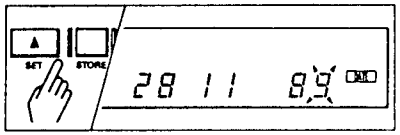


The clock setting changes to the date setting display.

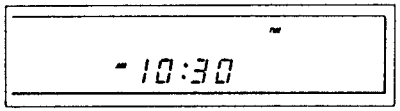


The day digit starts flashing.

5 Repeat steps 2 and 3 to set day, month and year. For example, the diagram shows that 28th of November 1989 have been set.



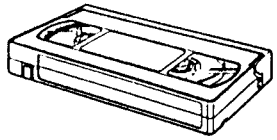
The date display changes to the clock display.



The day of week appears automatically. Now, the clock and date have been set.

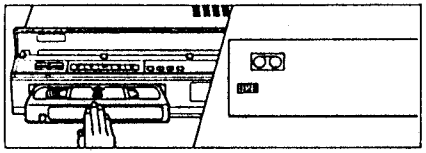
Notes:
- To correct the time and date after you have set them, repeat steps 1 – 5.
- If the power is interrupted, you will have to reset the clock and date.
- When the SET (clock/counter) button is pressed while OPERATE is off, the VTR switches between clock and date displays.

CASSETTE TAPES



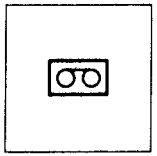
Use video cassette with the VHS mark in this VTR.

Insertion
Push the cassette through the door until the VTR mechanism pulls it into the compartment.

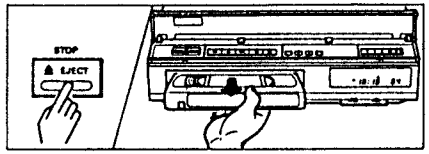


VTR power automatically turns on and the indicator turns on when the cassette is in place.

Indicator
Will light when the cassette is in the VTR regardless of turning the OPERATE switch on and off.



Removal
Press the STOP/EJECT button in the stop mode.



The cassette will come partially out of the compartment so you can pull it out.

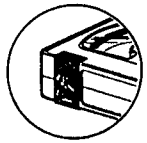
- The indicator turns off when the cassette is ejected.
- Cassette can be ejected with the power on or off.

To avoid erasing a recording

Break off the safety tab using a screwdriver or similar tool.

To re-record on a cassette which has its safety tab removed

Cover the hole with cellophane tape.

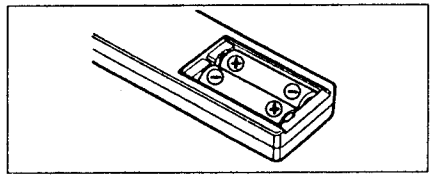


Remember that:
- The VTR automatically enters the playback mode when a cassette without a safety tab is inserted.
- The VTR automatically ejects the cassette if the REC button is pressed when a cassette without a safety tab is in the VTR.
- Be sure to check the safety tab before inserting a cassette for the above reasons.

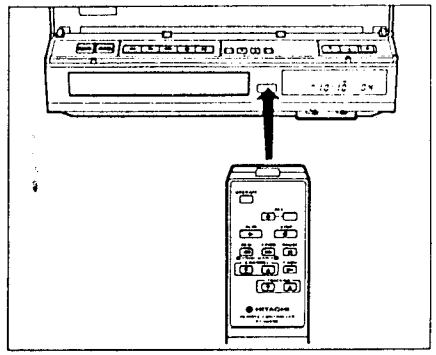
REMOTE OPERATION

You can operate the VTR from a distance using the Infrared Remote Control unit which performs the same functions as the corresponding buttons on the VTR.

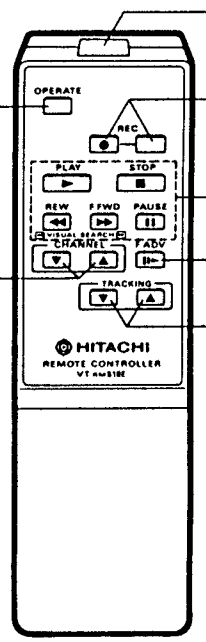
Power source of infrared remote control unit
The infrared remote control unit is powered by two batteries (size IEC standard R6). The life of the batteries is about a year although it depends on the numbers of times the unit is used. Replace the batteries when operation is not possible or when the distance becomes too small.



Remote operation
To operate the VTR with the infrared remote control unit, point it at the receiver on the front panel of the VTR.



Controls and function



Transmission window

OPERATE: Same as OPERATE on the VTR. (Turns operate on/off.)

REC: Press both buttons to start recording.

PLAY/STOP/PAUSE/REW/F.FWD: Same as on the VTR.

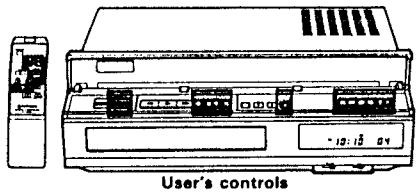
CHANNEL: Same as CHANNEL on the VTR. (Selects the next higher or lower TV station.)

F.ADV: Advances the picture from frame to frame during still playback. See page 17 for details.

TRACKING: Same as TRACKING on the VTR. (Minimizes noise in the picture.)

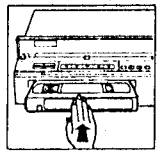
NOTE: The infrared rays will bounce off the walls and eventually reach the receiver on the VTR, but for best results transmit rays directly to the receiver.

RECORDING TV PROGRAMMES

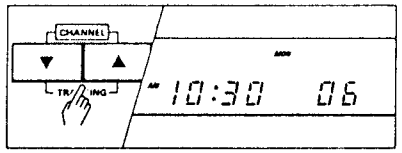


User's controls

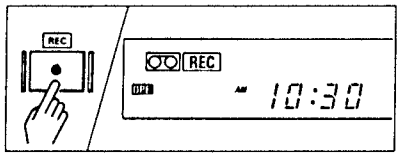
1 Insert a cassette.
Note: Be sure to check that the erase prevention tab is not missing. If it is removed, the VTR is set to playback mode automatically.



2 Select the programme to be recorded by pressing the CHANNEL button.

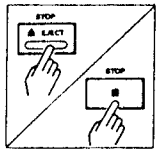


3 Press the REC button.



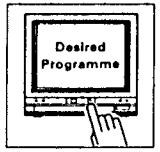
Now, recording starts.

4 After the recording has been made, press the STOP/EJECT or STOP button.

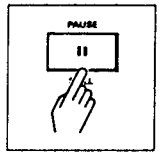


To view a programme while recording it
You can view a programme while recording it by merely selecting the video channel (described on page 9) with your TV's channel button.

To record one programme while viewing another
You can record one programme while veiwing another by merely selecting the programme to be viewed on your TV. The recorded programme can be viewed later at your convenience.

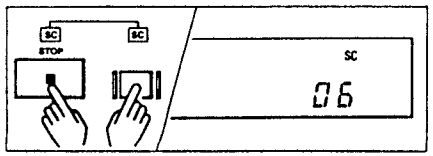


Notes:
1. If you want to avoid recording unwanted material, press the PAUSE button. Press the PAUSE button again to release the pause mode. To prevent tape damage, the VTR will automatically switch from pause to stop after about 5 minutes.

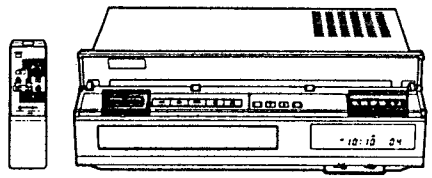


2. If you want to change programmes while in the record mode, press the PAUSE button then select the desired programme.
   Press the PAUSE button to release the pause mode.
3. If the cassette in the VTR has its safety tab removed, the VTR will eject it when the REC button is pressed.
4. Your TV does not have to be on to make a recording because the VTR reocrds TV programmes without the aid of your TV. It is only used for monitoring.

Simulcast recording (SC indicator)
When the STORE (SC) and STOP buttons are pressed at the same time, the SC indicator lights in the display. While the SC indicator is lit, you can record the video signal from the VTR's tuner and the audio signal from the AUDIO IN jack on the rear of the VTR.
Note: Be sure to press the STOP and STORE (SC) buttons simultaneosly.



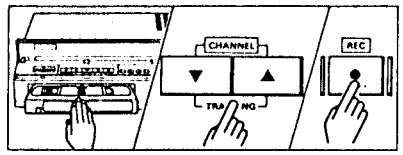
INSTANT RECORDING TIMER (IRT)



User's controls

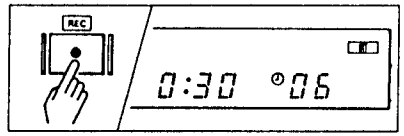
The Instant Recording Timer allows you to make simplified timer recording without using the programme timer. Before using the IRT function, set the clock correctly.

1 Follow the steps 1 through 3 on the "RECORDING TV PROGRAMMES".



Now, recording starts.

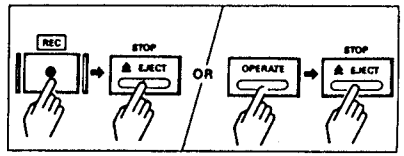
2 Then press the REC/IRT button again to indicate the recording time on the display.



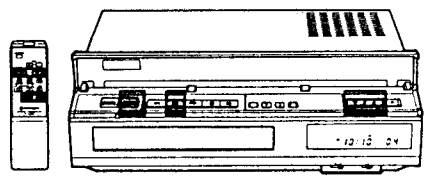
The time changes in hours and minutes in the order of 0:30, 1:00, 1:30, 2:00, 3:00 and 4:00 every time the button is pressed.
During recording, the remianing time is displayed.

3 At the end of recording the display changes to the clock time display and the VTR will automatically stop recording.

To stop IRT
- Press the REC/IRT button until the recording length display changes to the tape counter display or the clock time display, and the IRT recording is released and the VTR continues normal recording. Then press the STOP/EJECT button to stop recording.
- Or, press the OPERATE switch then the STOP/EJECT button within ten seconds.



PLAYBACK

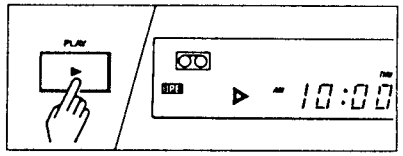


User's controls

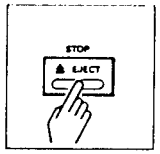
1 Turn the TV set on and select the video channel.

2 Insert the cassette.
Note: When the cassette (with its erase prevention tab removed) is loaded, playback starts automatically.

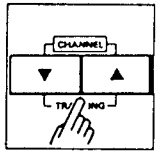
3 Press the PLAY button.



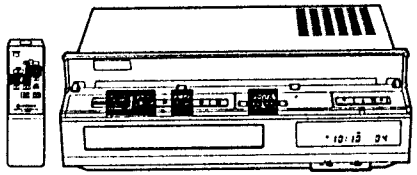
4 Press the STOP/EJECT button to stop playback.



Tracking control adjustment
When playing prerecorded tapes or those recorded on units other than your own, black and white streaks may appear on your TV screen. If this occurs, adjust the TRACKING controls until the streaks disappear. Pressing both buttons at the same time returns the tracking to the normal position.



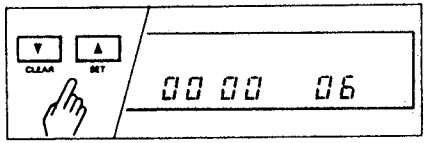
SPECIAL CHARACTERISTICS



User's controls

Tape counter

This indicates the amount of video tape transported as a number. Press the SET (Clock/Counter select) button to display the tape counter in the display then press the CLEAR (Counter reset) button to set the counter reading to the "0000" when starting recording or playing back.

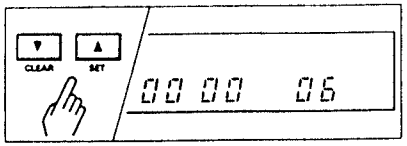


Note the number on the tape counter at the beginning and end of each programme you record. This will allow you to use the counter to find the desired programme later.

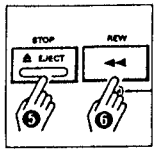
Counter memory function

This is useful if there is a section of tape you want to view immediately after recording or if you want to return to the same point several times.

1. Begin recording or playing back a tape.
2. Press the SET (Clock/Counter select) button to display the tape counter in the display.
3. At the point where you want playback to begin, reset the tape counter to "0000" by pressing the CLEAR (Counter reset) button.



4 Continue to play or record.
5. Press the STOP/EJECT button when recording or playback finishes.
6. Press the REW button.



The tape will automatically stop at the position where "0000" was preset.

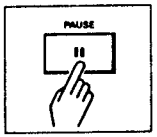
Actually, so that you won't miss the very first part of the programme, the tape will stop slightly prior to "0000", at a reading of approximately "9997".

Notes:

- The counter memory function will also operate in the fast-forwarding mode.
- The counter memory function does not operate when the clock indication is displayed.

Still playback

Press the PAUSE button to stop the picture on the screen during playback. Press the PAUSE button again to reset to normal playback or the STOP/EJECT button to stop the tape.



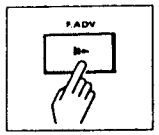
Notes:

- If you see vertical shaking on the TV screen in the still playback mode, rotate the VERT. SYNC. ADJ. control located on the rear panel to minimize shaking.

- When the still playback mode continues for about 5 minutes, the VTR switches to the stop mode automatically to prevent damage to the tape.
- The playback picture will contain some noise in the still playback mode.
- With some tapes, the picture may be distorted or the colour may disappear during still play.

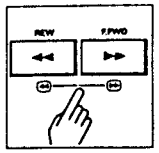
Frame advance

When you hold the F.ADV button on the remote control unit down during the still playback mode, tape will be played back frame by frame. It operates only after PAUSE button has been pressed.



Visual search

This allows you to view the played back picture at high speed in both the forward and reverse directions. Press the PLAY button to play a tape, then press either the REW or F.FWD button. Pictures can be viewed at high speed in either the forward or reverse direction.



Note: The playback picture will have some noise in the visual search mode.

Automatic rewind

The VTR automatically rewinds the tape when the end of the tape is reached.

Note: To prevent accidental tape erasure, the VTR does not rewind the tape after timer recording.

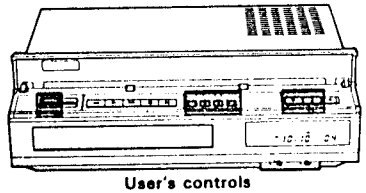
Rewind shut off

If the OPERATE switch is pressed during rewind operation, power will be turned off automatically after the tape has been completely rewound.

Note: If the tape counter is turned on, the VTR will stop rewinding and switch off at the specified position.

TIMER RECORDING

The programmable electronic clock/timer permits the unattended recording of 4 preselected programmes within a period of 1 year, including the same programme(s) repeated on every day and the same programme(s) every week. It turns the unit on and off and selects the programme automatically.



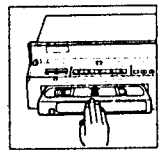
User's controls

Preparations for timer recording

- Your TV does not have to be on to make a recording because the VTR records TV programmes without the aid of your TV. it is only used for monitoring.

1 Make sure that the clock shows the present time and day correctly.

2 Insert a cassette.
Be sure to check that the record safety tab is not missing. If the record safety tab is missing, recording will not begin.



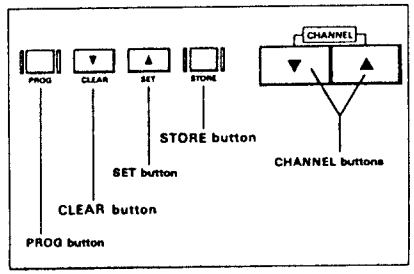
3 Programme the timer.

You can programme the timer to do the following:

- Record a programme on a single day up to 1 year a way — **NORMAL PROGRAMME**
- Record a programme at the same time on every day — **DAILY PROGRAMME**
- Record a programme on one certain day of every week — **WEEKLY PROGRAMME**

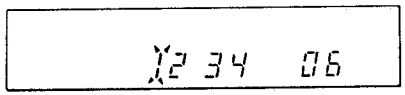
Things to know before you start:

- You have one minute to do each step in the programming procedure. If you do not proceed to the next step, all entries are erased and the clock display reappears. If this happens simply start over.
- The buttons for programming the timer are shown below.



- If you input erroneous information by mistake when programming the timer, press the CLEAR button and input the correct information.

1 Press the PROG button.



Programme input number 1 starts flashing.

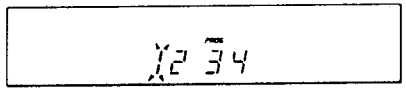
Notes:

- The display prompt you to select a programme input number.
- 4 programme input numbers are available and you can enter the different programming in each one.

2 Press the SET button to select an unused programme input number.

Important!

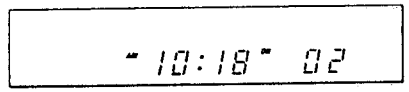
- When the programme input numbers have been set, their PROG indicators light to warn you. For example, the diagram below shows that programme input number 1 has been set.



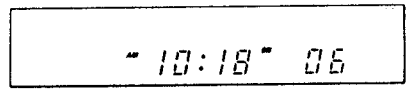
Select a number whose PROG indicator does not light.

- If the programme input number 1 is unused (the PROG indicator is not on), skip this step.

3 Press the STORE button when the unused number appears.

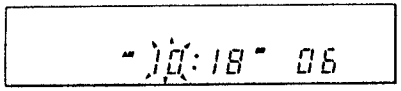


4 Choose the TV station number to be recorded by pressing the TV CHANNEL button.



For example, the above diagram shows the TV station number 6 has been chosen.

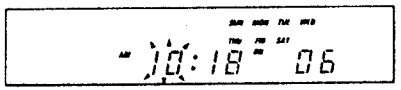
5 **For NORMAL PROGRAMME:**
Press the STORE button once. Hour starts flashing.



Then go to step 6.

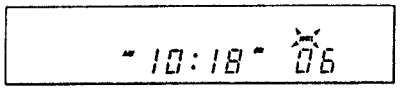
For DAILY PROGRAMME:
Press the SET button once. All days of week start flashing.

Then press the STORE button. Hour starts flashing.

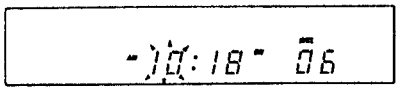


And then go to step 6.

For WEEKLY PROGRAMME:
Press the SET button twice. The WKL indicator starts flashing.

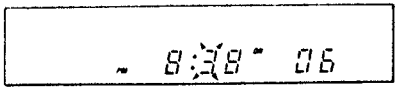


Then press the STORE button. Hour starts flashing.



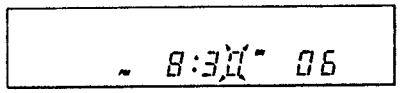
And then go to step 6.

6 Select the hour for recording to start by pressing the SET button. Hold down the button to advance rapidly.
Press the STORE button after selecting the hour for recording to start. The 10-minute digit starts flashing.

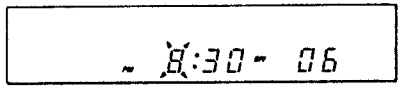


For example, the above diagram shows "PM8" hour has been set.

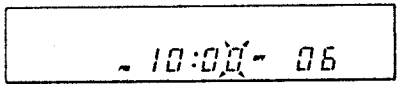
7 Select the 10-minute for recording to start by pressing the SET button.
Press the STORE button after selecting the 10-minute for recording to start.
Then select the 1st-minute by pressing the UP button.



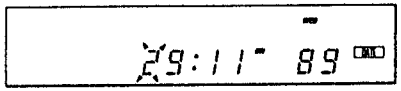
For example, the above diagram shows "30" minute has been set.
Then press the STORE button. "OFF" appears instead of "ON" and the hour starts flashing.



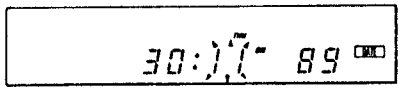
8 Select the hour and minute to stop recording by pressing the SET and STORE buttons.



For example, the above diagram shows "PM 10:00" has been set.
Be sure to press the STORE button after selecting the 1st-minute.
The current date appears.



9 Select the day and month to start recording by pressing the SET and STORE buttons.



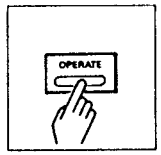
For example, the above diagram shows recording on 30th of November.

Notes:
- The day of week appears automatically.
- If you want to start recording on the current day, simply press the STORE button repeatedly to store the current date.

After setting the day and month, press the STORE button.
The display shows the start time, stop time and start date at a few seconds intervals.
Finally the display returns to the clock time display together with letters "PROG" automatically.
The "PROG" shows that the timer has been programmed.

Now, one programme has been completed. If required, repeat above steps for other programmes.

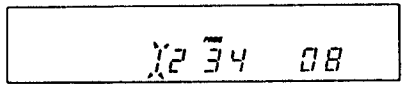
10 Turn off the OPERATE switch. The "⏲" indicator will come on.



Notes:
1. If the erase prevention tab is removed, the cassette is ejected automatically and "⏲" indication will flash. Stick a piece of cellophane tape over the erase prevention hole on the cassette to enable recording.
2. The "⏲" indication will flash, if a cassette is not inserted.

To check programming

1 Press the PROG button.
The programme input number 1 flashes.

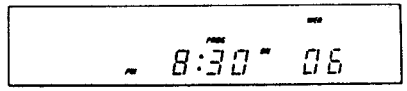


2 Press the SET button repeatedly until the programme input number to be checked appears.

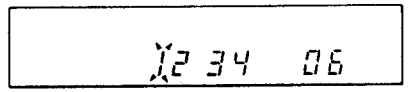
3 Press the STORE button when the programme input number to be checked appears.
The display shows the start time, the stop time and the start date at a few seconds intervals.
At this cycle the display returns to the programme input number display (shown in step 1 above) and the next programme input number starts flashing.
If you check the next programming, simply press the STORE button.
At the end of cycle the display returns to the clock time display automatically.
Note: As described previously, the PROG indicators whose programme input numbers have been set light to warn you. When the STORE button is pressed if no PROG indicator lights, the VTR enters the programming mode.

To clear a programme

1 Perform step 1 through 3 of "To check programming" to display the programme to be cleared.



2 Press the CLEAR button.



The display returns to the programme input number display and the "PROG" indicator goes off to show that the programming has been cleared.
The display returns to the clock time display after approx. one minute.

Be sure to press the CLEAR button while the display shows the start/stop times or start date. The programming does not clear if the CLEAR button is pressed when the display returns to the clock time display.

Programming errors
If programmes overlap, the VTR will select the programme with the earliest start time. When that programme is over, the VTR will switch to the next programme. If the start times are the same, the VTR will select the programmes in numerical order.

To stop timer recording
After timer recording starts, the VTR will stop at the preset time automatically and power will be turned off.
To stop timer recording midway, press the OPERATE switch and then press the STOP/EJECT button within 10 seconds.

Note: If the power is interrupted, the programmings are erased from memory. You will have to reset the clock, date, and programming.

DISASSEMBLY

1. IDENTIFICATIONS AND LOCATIONS OF CIRCUIT BOARDS
   (See page 2-3 for details on removing the following circuit boards.)

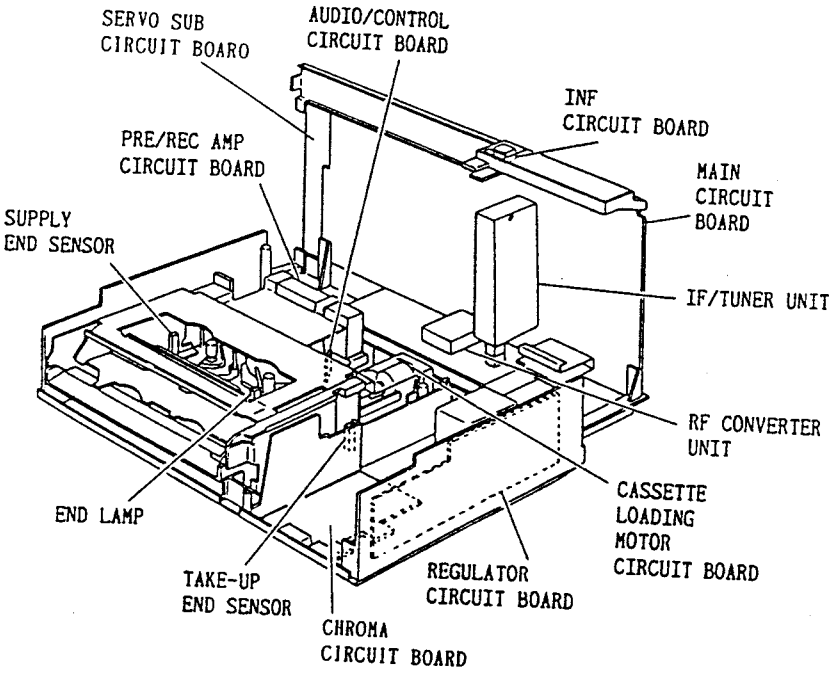


Fig. 1-1 Top View

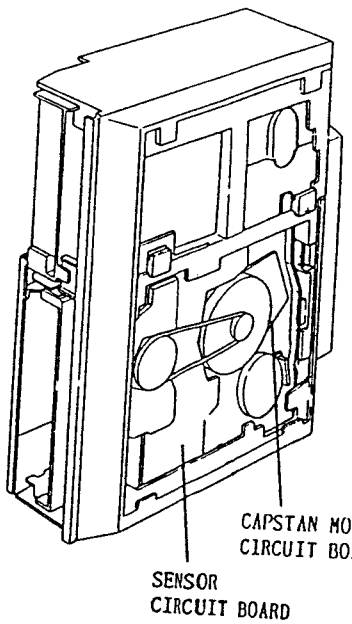


Fig. 1-2 Bottom View

2. IDENTIFICATIONS AND LOCATIONS OF MAIN MECHANICAL COMPONENTS
   (See page 2-4 for details on removing the following components.)

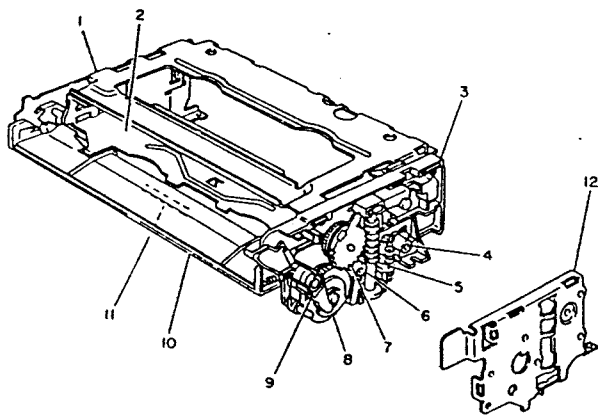


Fig. 2-1 Cassette Loading Mechanism

1. CHASSIS HOLDER
2. CASSETTE HOLDER
3. GEAR BRACKET
4. SWITCH LEVER B
5. FL WORM GEAR
6. SWITCH LEVER A
7. WORM WHEEL
8. DRIVE GEAR
9. DOOR ARM
10. FRONT HOLDER
11. SHAFT PIN
12. SIDE CHASSIS

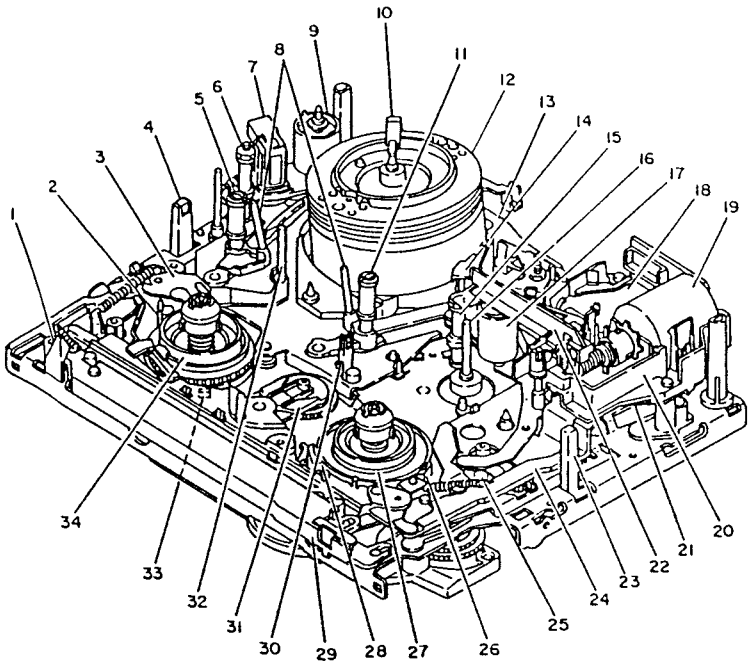


Fig. 2-2 Top View of Mechanism

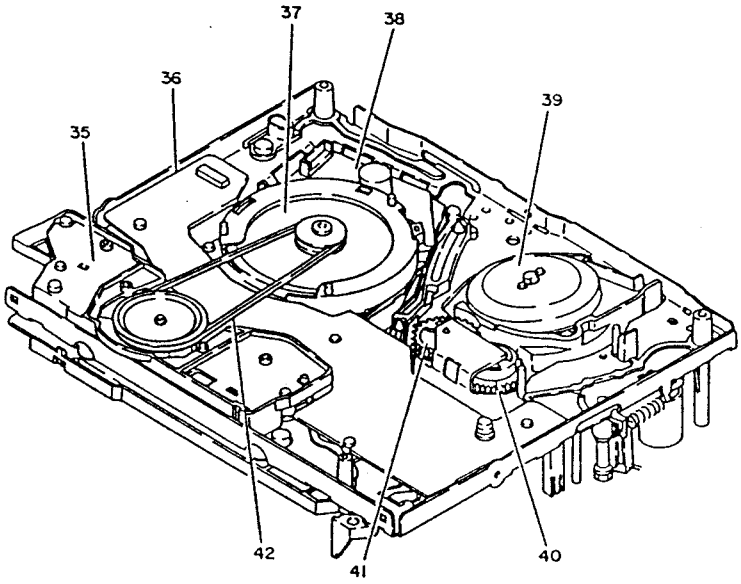


Fig. 2-4 Bottom View of Mechanism

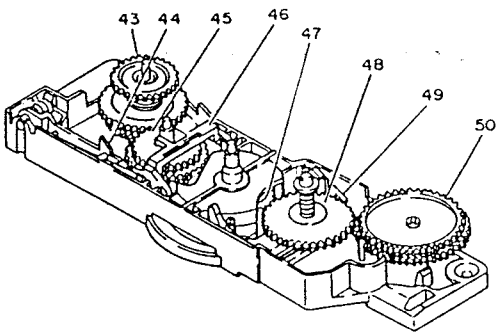


Fig. 2-4 Clutch Base

1. SAFETY ARM
2. TENSION BAND ASSEMBLY
3. TENSION ARM
4. SUPPLY REEL SENSOR
5. SUPPLY GUIDE ROLLER
6. SUPPLY GUIDE POLE
7. FULL ERASE HEAD
8. INCLINED GUIDE
9. IMPEDANCE ROLLER
10. STATIC DISCHARGE BRUSH
11. TAKE-UP GUIDE ROLLER
12. CYLINDER MOTOR ASSEMBLY
13. CYLINDER BASE
14. AUDIO/CONTROL (A/C) HEAD
15. TAKE-UP GUIDE POLE
16. CAPSTAN SHAFT
17. PRESSURE ROLLER ASSEMBLY
18. MECHANISM STATE SWITCH
19. LOADING MOTOR ASSEMBLY
20. LOADING MOTOR HOLDER
21. LOAD BRACKET
22. CASSETTE LID OPENER
23. TAKE-UP REEL SENSOR
24. BRAKE LINK ARM
25. PRESSURE ROLLER OPERATION ARM
26. TAKE-UP BRAKE ASSEMBLY
27. TAKE-UP REEL DISK
28. TAKE-UP MAIN BRAKE
29. SLIDER BLOCK ASSEMBLY
30. END LAMP
31. REEL DRIVE IDLER
32. TENSION POLE
33. SUPPLY MAIN BRAKE
34. SUPPLY REEL DISK
35. CLUTCH BASE ASSEMBLY
36. SENSOR P.C.B
37. CAPSTAN MOTOR
38. CAPSTAN MOTOR P.C.B
39. CYLINDER MOTOR ASSEMBLY
40. SUPPLY LOADING GEAR
41. TAKE-UP LOADING GEAR
42. REEL BELT
43. TAKE-UP GEAR
44. CLUTCH ARM
45. CHANGE GEAR
46. CHANGE ARM
47. TAKE-UP PULLEY
48. FL CHANGE GEAR
49. FL CHANGE ARM
50. RELAY GEAR

3. CASE REMOVAL

Top Cover, Bottom Cover, Front Panel, Cassette Door (Fig. 3-1, 3-2)

Top Cover

1) Remove two (2) screws.
2) Lift the rear of the top cover and move the whole cover backwards.

Bottom Cover

3) Remove two (2) screws.
4) Release the stopper and slide the bottom cover.

Front Panel

5) Remove one (1) screw.
6) Release two (2) stoppers and lift the front panel to pull it out to the front.

[Caution]

When reinstalling, push up the cassette door and insert the panel into the door arm from above.

Cassette Door

7) Press the stopper inside the front panel in the direction of arrow (A).
8) Press the cassette door in the direction of arrow (B) to release the boss of the cassette door and pull out the door.

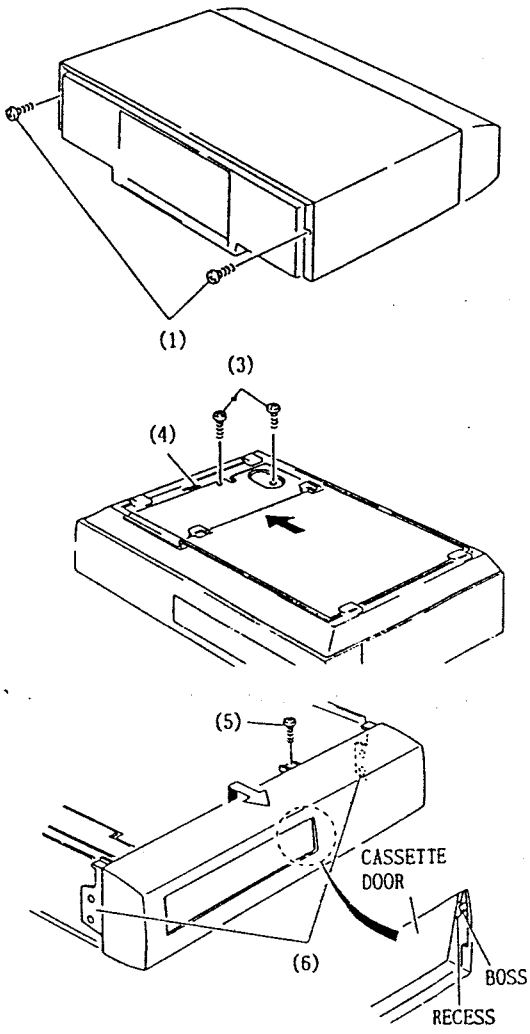


Fig. 3-1 Case Removal

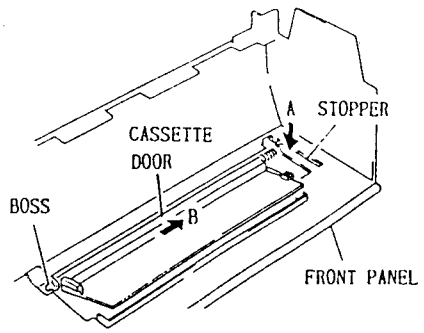


Fig. 3-2 Cassette Door

4. CIRCUIT BOARD REMOVAL

1. Main Circuit Board/Front Switch (Fig. 4-1

1) Remove the top cover and front panel. (See CASE REMOVAL)

Main Circuit Board

2) Release three (3) stoppers.
3) Open the main circuit board in the direction of arrow (A).

Front Switch

4) Remove three (3) screws.
5) Release five (5) stoppers and slide the front switch in the direction of arrow

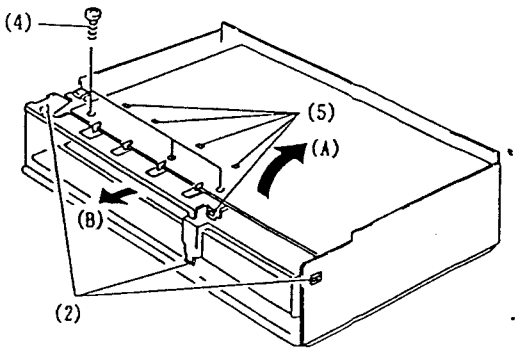


Fig. 4-1 Main Circuit Board/ Front Switch

2. INF Circuit Board (Fig. 4-2)

1) Remove the top cover and front panel. (See CASE REMOVAL)
2) Open the main circuit board. (See Fig. 4-1)
3) Release two (2) stoppers and pull out the INF circuit board.

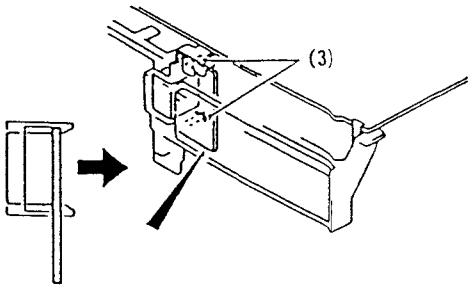


Fig. 4-2 INF Circuit Board

3. Chroma Circuit Board (Fig. 4-3)
   1) Remove the top cover and front panel. (See CASE REMOVAL)
   2) Open the main circuit boad. (See Fig. 4-1)
   3) Remove one (1) screw.
   4) Release one (1) stopper and pull out the Chroma circuit board.

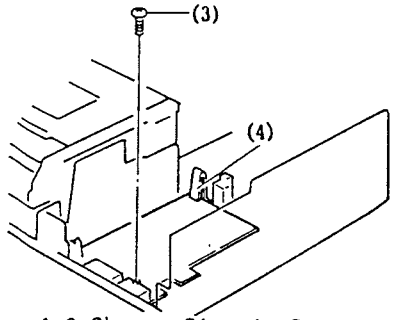


Fig. 4-3 Chroma Circuit Board

4. Regulator Circiut Board (Fig. 4-4)
   1) Remove the top cover, bottom cover and front panel. (See CASE REMOVAL)
   2) Open the main circuit board. (See Fig. 4-1)
   3) Remove one (1) screw.
   4) Remove the regulator circuit board in the direction of arrow (A) while releasing two (2) stoppers.

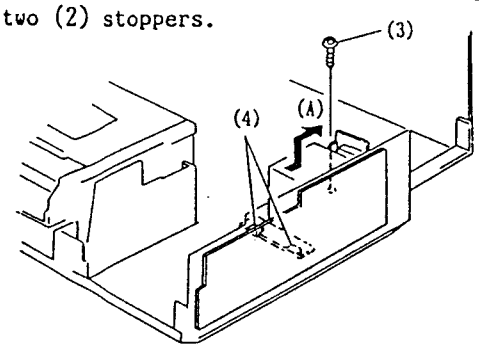


Fig. 4-4 Regulator Circuit Board

5. PRE/REC AMP Circuit Board (Fig. 4-5)
   1) Remove the top cover and front panel. (See CASE REMOVAL)
   2) Open the main circuit board. (See Fig. 4-1)
   3) Remove one (1) screw and lift up the shield cover.
   4) Remove two (2) screws.
   5) Pull out the circuit board in the direction of arrow (A).

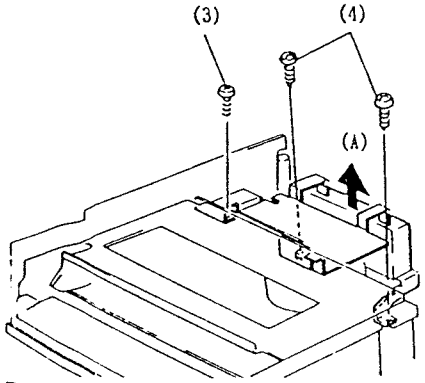


Fig. 4-5 PRE/REC AMP Circuit Board

6. Sensor Circuit Board (Fig. 4-6)
   1) Remove the top cover, bottom cover and front panel. (See CASE REMOVAL)
   2) Open the main circuit board. (See Fig. 4-1)
   3) Remove the PRE/REC AMP circiut board. (See Fig. 4-5)
   4) Remove the cassette loading mechanism. (See item 1 in the section on CASSETTE LOADING MECHANISM REMOVAL)
   5) Remove three (3) screws and each holder.
   6) Release two (2) stoppers and separate the mechanism assembly from the chassis.
   7) Remove the reel belt from the back of the mechanism assembly.
   8) Remove four (4) screws and take out the sensor circuit board.

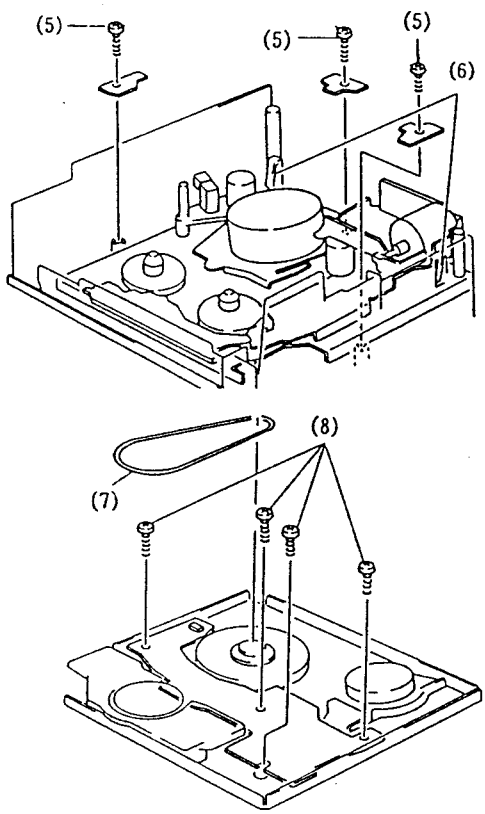


Fig. 4-6 Sensor Circuit Board

5. CASSETTE LOADING MECHANISM REMOVAL
   1. Cassette Loading Mechanism
      * Components listed below are described as if the top and bottom covers, front panel and the cassette loading mechanism have already been removed. (See CASE REMOVAL and item 1 in the section on CASSETTE LOADING MECHANISM REMOVAL.)
   2. Loading Gear Assembly, Chassis Holder, Cassette Holder Assembly and Front Holder
   3. Cassette Holder Base and Cassette Holders (L/R)

1. Cassette Loading Mechanism (Fig. 5-1)
   1) Remove the top cover and front panel. (See CASE REMOVAL)
   2) Open the main circuit board. (See Fig. 4-1)
   3) Remove one (1) screw and lift up the shield cover.
   4) Remove two (2) screws.
   5) Lift up the rear of the mechanism and release the fittings on the front bottom.

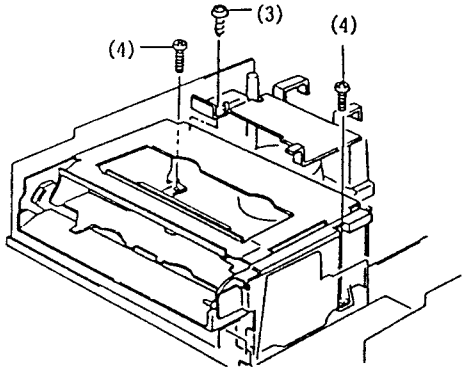


Fig. 5-1 Cassette Loading Mechanism

2. Loading Gear Assembly, Chassis Holder, Cassette Holder Assembly and Front Holder

Loading Gear Assembly (Fig. 5-2)
   1) Release two (2) tabs that engage with the chassis holder and one (1) tab that engages with the front holder, then separate the loading gear assembly.

Chassis Holder
   2) Release two (2) tabs that engage with the front holder.

Cassette Holder Assembly
   3) Separate the drive gear and remove the cassette holder assembly.

Front Holder
   4) Remove the shaft pin and drive arm L.

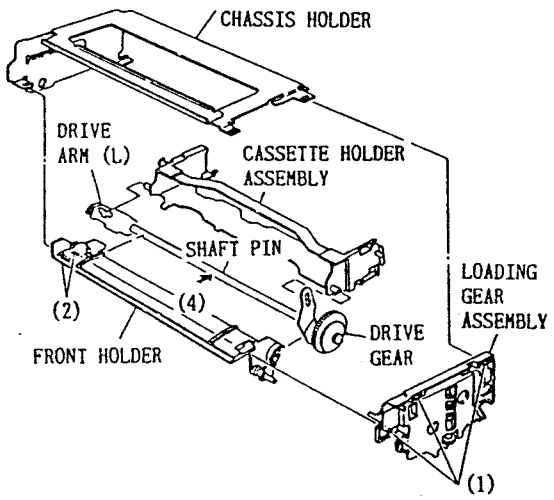


Fig. 5-2 Loading Gear Assembly, Chassis Holder, Cassette Holder Assembly and Front Holder

3. Cassette Holder Base and Cassette Holders (L/R) (Fig. 5-3)

Cassette Holder Base
   1) Release four (4) tabs on the L/R cassette holders.

Cassette Holders (L/R)
   2) Release the tabs on the cassette holders L/R and pull out the holders.

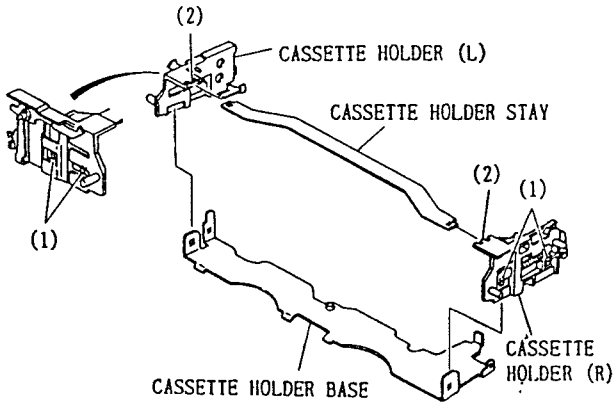


Fig. 5-3 Cassette Holder Base and Cassette Holders (L/R)

[Cautions when reinstalling]

Reinstall the components by the reverse procedure to removal, taking care of the following items.

* Check that two (2) bosses of the cassette holder are inserted into the grooves on the left of the chassis holder. (Fig. 5-4)
* When reinstalling the loading gear assembly, check that two (2) bosses of the cassette holder are inserted into the grooves on the right of the chassis holder. (Fig. 5-5)
* Check that marking (△) on the synchro gear and marking (◇) on the clutch gear are aligned. (Fig. 5-5)
* Check that the boss of cassette switch lever (A) is set to the cam of the synchro gear.

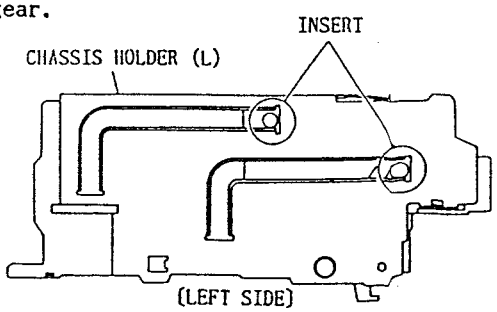


Fig. 5-4

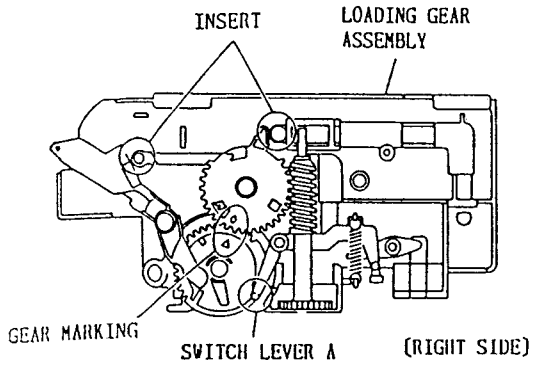


Fig. 5-5

5. LOADING GEAR REMOVAL

1. Side Chassis, FL Worm Gear, Door Arm, Worm Wheel and Switch Levers A/B (Fig. 6-1)

Side Chassis

1) Release four (4) tabs that engage with the loading gear assembly.

FL Worm Gear

2) Pull out the FL worm gear.

Door Arm

3) Remove the spring between the door arm and gear bracket.
4) Pull out the door arm.

Worm Wheel

5) Pull out the worm wheel.

Switch Levers A/B

6) Remove the spring between switch lever (A) and the gear bracket.
7) Pull out switch levers (A) and (B).

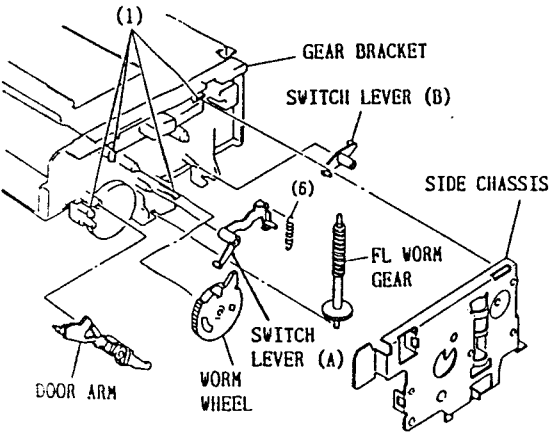


Fig. 6-1 Side Chassis, FL Worm Gear, Door Arm, Worm Wheel and Switch Levers A/B

7. MAIN MECHANICAL COMPONENTS REMOVAL

1. Heads
   - Impedance Roller/FE (Full Erase) Head
   - A/C (Audio/Control) Head
3. Capstan Motor Assembly
4. Loading Motor, Mechanism State Switch Assembly
5. Tension Arm, Tension Band
6. Slider Block, Reel Drive Idler
7. Supply/Take-up Reel Disks
8. Rollers and Guides
   - Pressure Roller
   - Supply Guide Pole
   - Take-up Guide Pole
   - Supply/Take-up Guide Rollers
9. Loading Motor Assembly, Brake Link Arm and FS Brake Arm
10. Load Bracket Assembly and Take-up Brake
11. Brake Operation Arm, Mode Gear, Worm Wheel, Pressure Roller Operation Arm, Mode Change Arm and Brake Lift Arm
12. Supply/Take-up Loading Arms
13. Take-up Pulley and Clutch Gear Assembly
14. Take-up Gear, Change Arm, Change Gear, FL Change Gear and FL Change Lever

1. Cassette Loading Mechanism (Fig. 5-1)
   1) Remove the top cover and front panel. (See CASE REMOVAL)
   2) Open the main circuit board. (See Fig. 4-1)
   3) Remove one (1) screw and lift up the shield cover.
   4) Remove two (2) screws.
   5) Lift up the rear of the mechanism and release the fittings on the front bottom.

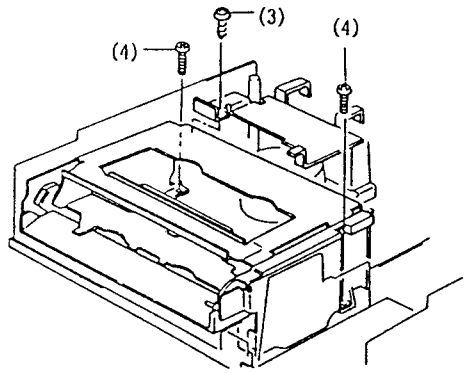


Fig. 5-1 Cassette Loading Mechanism

2. Loading Gear Assembly, Chassis Holder, Cassette Holder Assembly and Front Holder

Loading Gear Assembly (Fig. 5-2)
   1) Release two (2) tabs that engage with the chassis holder and one (1) tab that engages with the front holder, then separate the loading gear assembly.

Chassis Holder
   2) Release two (2) tabs that engage with the front holder.

Cassette Holder Assembly
   3) Separate the drive gear and remove the cassette holder assembly.

Front Holder
   4) Remove the shaft pin and drive arm L.

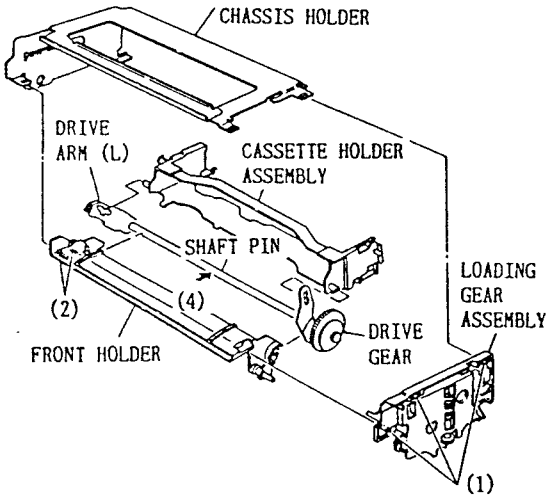


Fig. 5-2 Loading Gear Assembly, Chassis Holder, Cassette Holder Assembly and Front Holder

3. Cassette Holder Base and Cassette Holders (L/R) (Fig. 5-3)

Cassette Holder Base
   1) Release four (4) tabs on the L/R cassette holders.

Cassette Holders (L/R)
   2) Release the tabs on the cassette holders L/R and pull out the holders.

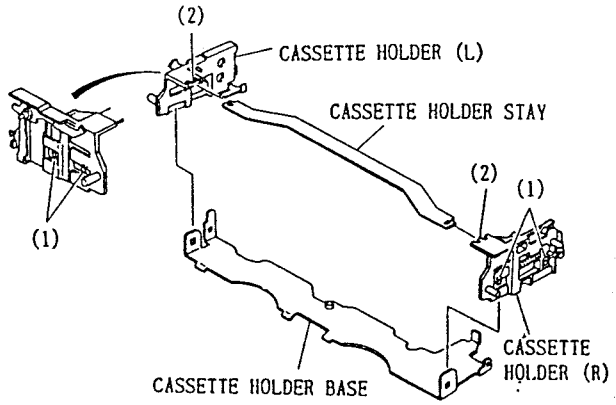


Fig. 5-3 Cassette Holder Base and Cassette Holders (L/R)

(Cautions when reinstalling)

Reinstall the components by the reverse procedure to removal, taking care of the following items.

* Check that two (2) bosses of the cassette holder are inserted into the grooves on the left of the chassis holder. (Fig. 5-4)
* When reinstalling the loading gear assembly, check that two (2) bosses of the cassette holder are inserted into the grooves on the right of the chassis holder. (Fig. 5-5)
* Check that marking (△) on the synchro gear and marking (◇) on the clutch gear are aligned. (Fig. 5-5)
* Check that the boss of cassette switch lever (A) is set to the cam of the synchro gear.

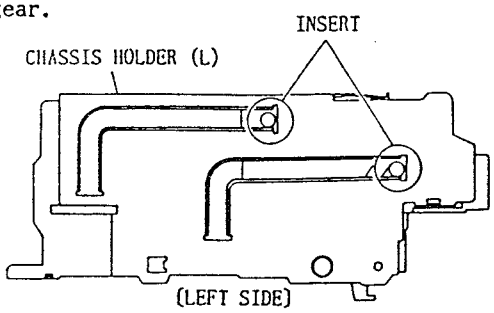


Fig. 5-4

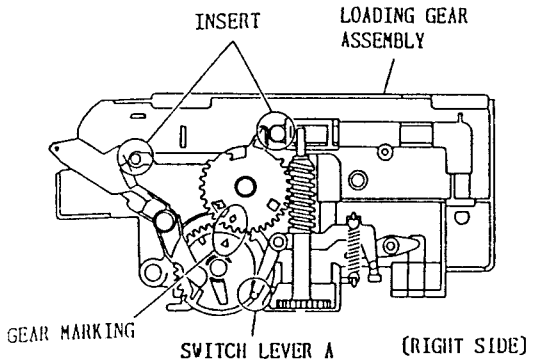


Fig. 5-5

6. LOADING GEAR REMOVAL

1. Side Chassis, FL Worm Gear, Door Arm, Worm Wheel and Switch Levers A/B (Fig. 6-1)

Side Chassis

1) Release four (4) tabs that engage with the loading gear assembly.

FL Worm Gear

2) Pull out the FL worm gear.

Door Arm

3) Remove the spring between the door arm and gear bracket.
4) Pull out the door arm.

Worm Wheel

5) Pull out the worm wheel.

Switch Levers A/B

6) Remove the spring between switch lever (A) and the gear bracket.
7) Pull out switch levers (A) and (B).

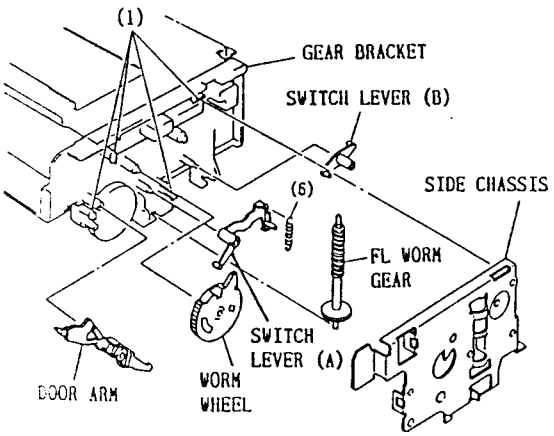


Fig. 6-1 Side Chassis, FL Worm Gear, Door Arm, Worm Wheel and Switch Levers A/B

7. MAIN MECHANICAL COMPONENTS REMOVAL

1. Heads
   - Impedance Roller/FE (Full Erase) Head
   - A/C (Audio/Control) Head
2. Capstan Motor Assembly
3. Loading Motor, Mechanism State Switch Assembly
4. Tension Arm, Tension Band
5. Slider Block, Reel Drive Idler
6. Supply/Take-up Reel Disks
7. Rollers and Guides
   - Pressure Roller
   - Supply Guide Pole
   - Take-up Guide Pole
   - Supply/Take-up Guide Rollers
8. Loading Motor Assembly, Brake Link Arm and FS Brake Arm
9. Load Bracket Assembly and Take-up Brake
10. Brake Operation Arm, Mode Gear, Worm Wheel, Pressure Roller Operation Arm, Mode Change Arm and Brake Lift Arm
11. Supply/Take-up Loading Arms
12. Take-up Pulley and Clutch Gear Assembly
13. Take-up Gear, Change Arm, Change Gear, FL Change Gear and FL Change Lever

1. Head

Impedance Roller/FE (Full Erase) Head (Fig. 7-1)

1) Remove the top cover. (See CASE REMOVAL)
2) Remove the spring between the FE head base and chassis.
3) Disconnect the connector.
4) Remove the nut holding the guide pole and pull out the pole.
5) Release one (1) tab and remove the impedance roller/FE head.
6) To separate the FE head, release two (2) tabs and pull out the FE head.

A/C (Audio/Control) Head (Fig. 7-1)

7) Disconnect the connector.
8) Remove the nut holding the head base and pull the base up and out.

* Hook the bottom of the spring under the head base to the chassis and the top to the stopper of the head base.

[Cautions when reinstalling]

* Check that the spring section of the A/C head retaining screw protrudes 6.3 mm above head base (1)
* Check that head bases (1) and (2) are parallel.

[Adjustments after reinstallation]

A/C Head Adjustment
X-Value Adjustment
Audio Playback Level Adjustment
Audio Bias Level Adjustment

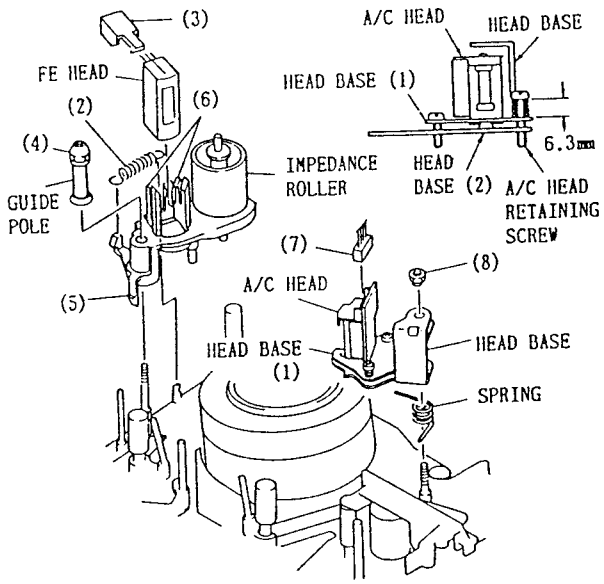


Fig. 7-1 Impedance Roller/FE (Full Erase) Head, A/C (Audio/Control) Head

3. Capstan Motor Assembly (Fig. 7-3)

1) Remove the bottom cover. (See CASE REMOVAL)
2) Remove the reel belt.
3) Disconnect the connector.
4) Remove three (3) screws and pull out the capstan motor assembly.

* Keep the capstan shaft clean when removing and reinstalling the capstan motor.

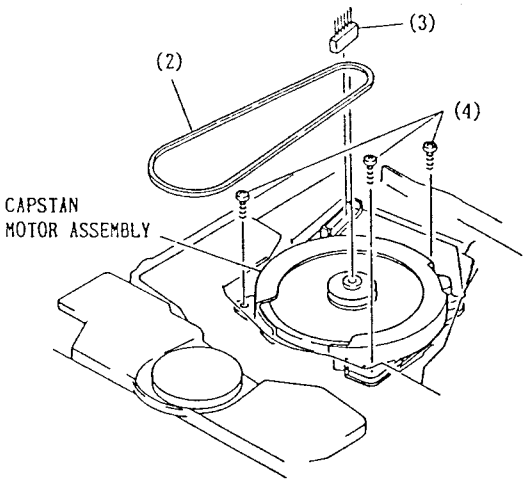
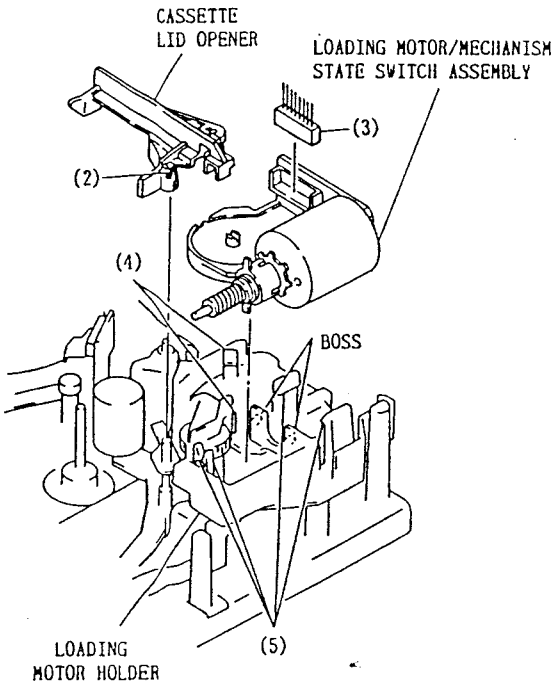


Fig. 7-3 Capstan Motor Assembly

Loading Motor/Mechanism State Switch Assembly (Fig. 7-4)

) Remove the top cover. (See CASE REMOVAL)
) Release one (1) tab and remove the cassette lid opener.
) Disconnect the connector.
) Release two (2) tabs holding the mechanism state switch.
) Release four (4) tabs, and while releasing two (2) bosses of the motor holder from the screw holes in the motor, lift up the loading motor/mechanism state switch assembly.



. 7-4 Loading Motor/Mechanism State Switch Assembly

Components 5 - 11 listed below will be discribed as if the top and bottom covers, front panel and the cassette loading mechanism have already been removed. (See CASE REMOVAL and item 1 in the section on CASSETTE LOADING MECHANISM REMOVAL)

Tension Arm/Tension Band (Fig. 7-5)

1) Remove the spring between the tension arm and spring holder.
2) Remove the screw holding the tension band.
3) Release the fitting with the tension arm, move the supply subbrake in the direction of the arrow and remove the tension band and tension arm.

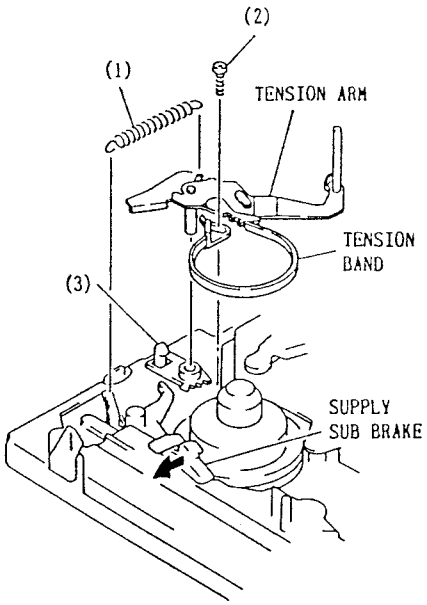


Fig. 7-5 Tension Arm/Tension Band

6. Slider Block and Reel Drive Idler

Slider Block (Fig. 7-6)

1) Remove two (2) screws.

[Cautions when reinstalling]

* Reinstall the slider block while pressing both subbrakes and the main brake in the directions of the arrows (A/B).
* Check that the bosses of the load bracket assembly are inserted into the sliders.

Reel Drive Idler (Fig. 7-6)

2) Pull out the reel drive idler from the take-up gear shaft.

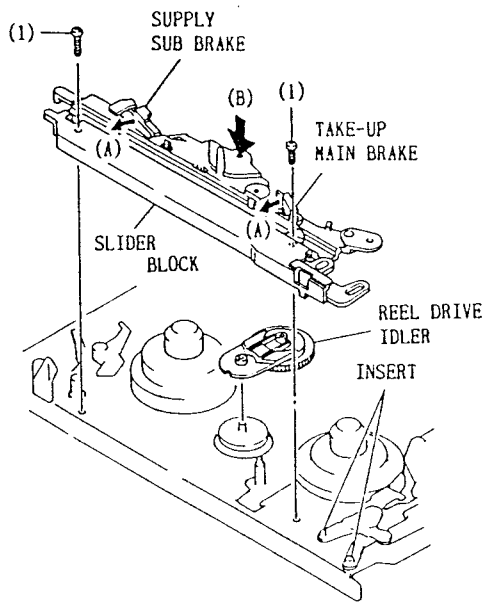


Fig. 7-6 Slider Block and Reel Drive Idler

7. Supply/Take-up Reel Disks

Supply Reel Disk (Fig. 7-7)

1) Remove the slider block. (See item 6)
2) Remove the tension arm and tension band. (See item 5)
3) Pull out the supply reel disk.

[Caution when reinstalling]

* Check that a spacer is put on the reel disk installation shaft.

[Adjustments after reinstallation]

Tension Pole Position and Tension Adjustments
Reel Disk Height Adjustment

Take-up Reel Disk (Fig. 7-7)

4) Move the take-up brake in the direction of the arrow and pull out the take-up reel disk.

[Caution when reinstalling]

* Check that a spacer is put on the reel disk installation shaft.

[Adjustments after reinstallation]

Reel Disk Height Adjustment

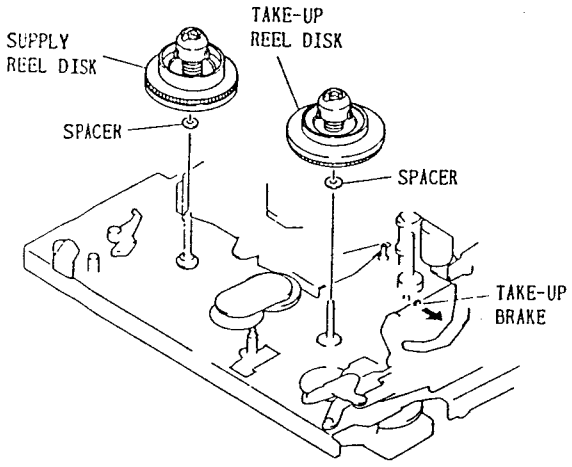


Fig. 7-7 Supply/Take-up Reel Disks

8. Roller and Guide (Fig. 7-8)

Pressure Roller

1) Release one (1) tab and remove the cassette lid opener.
2) Pull out the pressure roller assembly.

[Cautions when reinstalling]

* Check that the pin of the pressure roller is inserted into the hole in the pressure roller operation arm.
* Clean the tape contact surface of the pressure roller.

Supply Guide Pole

3) Loosen the guide pole retaining screw and pull out the guide pole.

[Caution when reinstalling]

* Clean the tape contact surface of the guide pole.

[Adjustment after reinstallation]

Guide Pole Height Adjustment

Take-up Guide Pole

4) Loosen the take-up guide pole retaining screw and pull out the guide pole.

[Caution when reinstalling]

* Clean the tape contact surface of the guide pole.

[Adjustment after reinstallation]

Guide Pole Height Adjustment

Guide Rollers

* Remove the supply and take-up guide rollers by the same procedure.

5) Loosen the guide roller retaining hexagonal screw.
6) Turn the guide roller counterclockwise to pull it out.

[Adjustment after reinstallation]

Guide Roller Height Adjustment

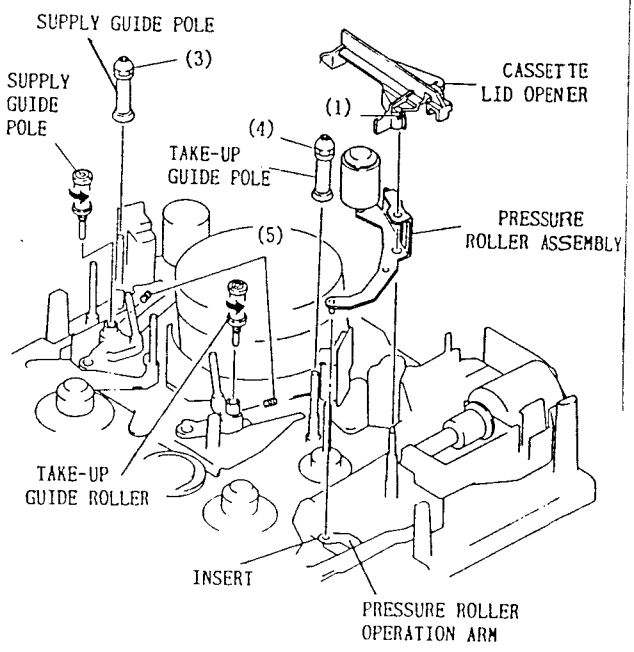


Fig. 7-8 Roller and Guide

. Loading Motor Block, Brake Link Arm and FS Brake Arm (Fig. 7-9)

Loading Motor Block

1) Release the tab and remove the cassette lid opener.
2) Disconnect the connector from the loading motor circuit board.
3) Remove two (2) screws and release three (3) tabs.
4) Remove the loading motor and motor holder while holding the section indicated by arrow (A) so that the load bracket assembly does not lift.

djustment after reinstallation]
Mechanism State Switch Adjustment

Brake Link Arm

5) Remove the slider block. (See item 6)
6) Remove the take-up reel disk. (See item 7)
7) Remove the spring between the brake link arm and load bracket.
8) Release the boss of the brake change arm and remove the brake link arm.

FS Brake Arm

9) Remove the spring between the FS brake arm and mechanism chassis.
10) Release one (1) tab and pull out the FS brake arm.

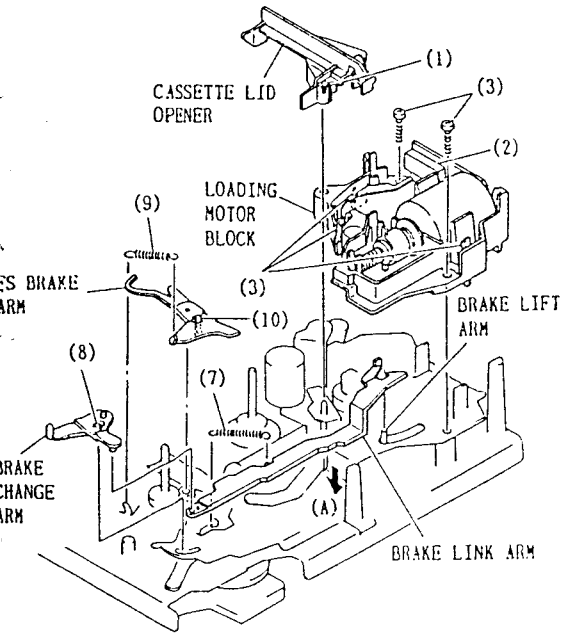


Fig. 7-9 Loading Motor Block, Brake Link Arm FS Brake Arm

. Load Bracket Assembly and Take-up Brake

Load Bracket Assembly (Fig. 7-10)

1) Remove the slider block. (See item 6)
2) Remove the take-up reel disk. (See item 7)
3) Remove the pressure roller. (See item 8)
4) Remove the loading motor block. (See item 9)
5) Remove the brake link arm. (See item 9)
6) Remove one (1) screw and draw the boss of the loading slide gear through the hole in the lift arm to lift up the assembly.

Take-up Brake (Fig. 7-10)

7) Remove the brake operation arm. (See item 11)
8) Release one (1) tab and remove the take-up brake.

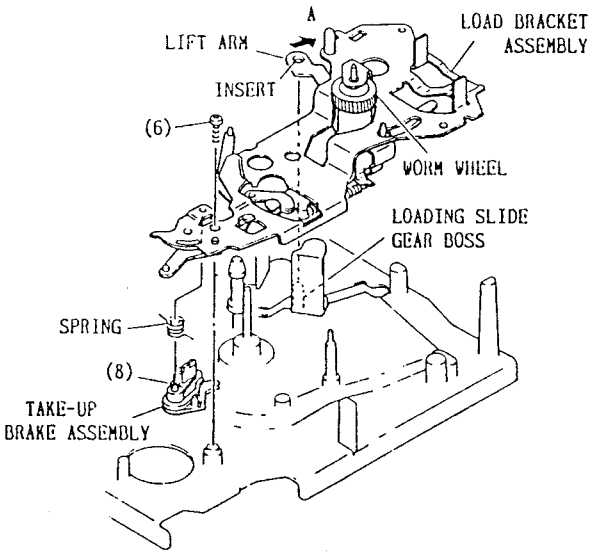


Fig. 7-10 Load Bracket Assembly and Take-up Brake

* Components in item 11 below will be described as if the load bracket assembly has already been removed. (See item 10)

11. Brake Operation Arm, Mode Gear, Worm Wheel, Pressure Roller Operation Arm, Mode Change Arm and Brake Lift Arm (Fig. 7-11)

Brake Operation Arm

1) Remove the washer and pull out the brake operation arm.

Mode Gear

2) Pull out the lift arm.
3) Pull out the mode gear.

Worm Wheel

4) Pull out the worm wheel.

Pressure Roller Operation Arm, Mode Change Arm

5) Remove the spring between the pressure roller operation arm and load bracket.
6) Pull out the pressure roller operation arm.
7) Release one (1) tab and pull out the mode change arm.

Brake Lift Arm

8) Pull out the brake lift arm.

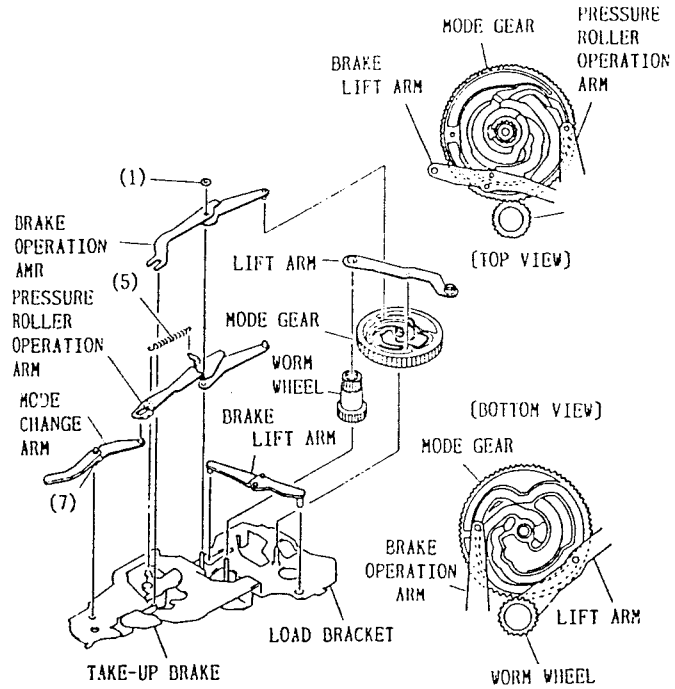


Fig. 7-11 Brake Operation Arm, Mode Gear, Worm Wheel, Pressure Roller Operation Arm, Mode Change Arm and Brake Lift Arm

12. Supply/Take-up Loading Arms (Fig. 7-12)
Cylinder Motor Base
1) Remove the cassette loading mechanism. (See item 1 in the section on CASSETTE LOADING MECHANISM REMOVAL)

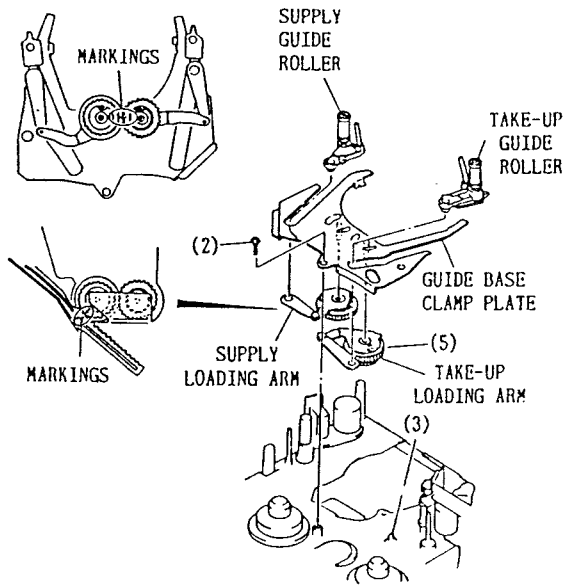


Fig. 7-12 Supply/Take-up Loading Arms

Supply/Take-up Loading Arms (Fig. 7-12)
2) Remove one (1) screw.
3) Release one (1) tab and remove the guide base clamp plate with the supply/take-up guide rollers assembled on it.
4) Release one (1) tab and remove the take-up loading arm.
5) Remove the supply loading arm.

13. Take-up Pulley and Clutch Gear Assembly
Take-up Pulley (Fig. 7-13)
1) Release the reel belt.
2) Remove the washer and pull out the take-up pulley.

Clutch Gear Assembly (Fig. 7-13)
3) Remove the cassette loading mechanism. (See item 1 in the section on CASSETTE LOADING MECHANISM REMOVAL)
4) Remove the slider block and reel drive idler. (See item 6)
5) Remove the reel belt in step 1) and remove three (3) screws.

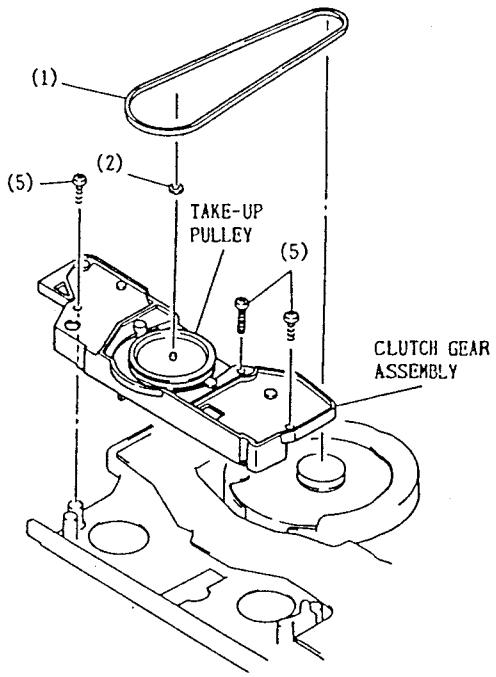


Fig. 7-13 Take-up Pulley and Clutch Gear Assembly

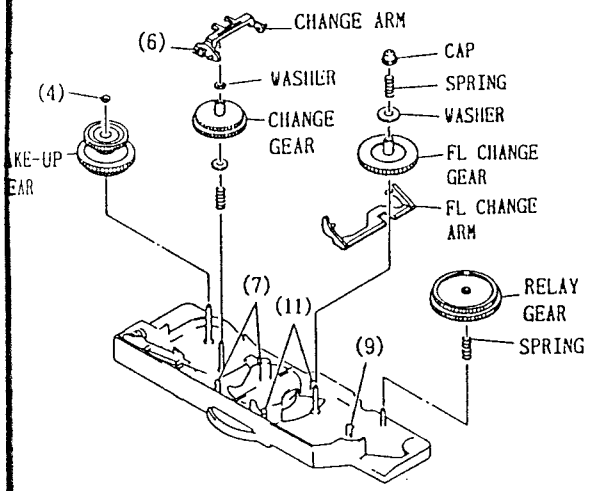
14. Take-up Gear, Change Arm, Change Gear, Relay Gear, FL Change Gear and FL Change Lever (Fig. 7-14)
1) Remove the cassette loading mechanism. (See item 1 in the section on CASSETTE LOADING MECHANISM REMOVAL)
2) Remove the slider block and reel drive idler. (See item 6)
3) Remove the clutch gear assembly. (See item 13)

ke-up Gear
) Remove the washer and pull out the take-up gear.

ange Arm, Change Gear
) Remove the take-up gear.
) Release one (1) tab and remove the spring hooked to the change arm.
) Release two (2) tabs and remove the change arm.
) Remove the washer and pull out the change gear.

ay Gear
) Release one (1) tab and pull out the relay gear.

Change Gear, FL Change Lever
) Remove the cap, spring and washer and pull out the FL change gear.
) Release two (2) tabs and remove the FL change lever.



7-14 Take-up Gear, Change Arm, Change Gear, Relay Gear, FL Change Gear and FL Change Lever

8. ATTACHING THE ROTOR MAGNET PLATE TO THE CYLINDER MOTOR

When the rotor magnet plate is removed for repairs or it is replaced, reinstall it correctly observing the following caution item.

[Caution on installation]

* The rotor magnet plate attached to the base of the the cylinder motor (illustrated as the top in the figure below) is equipped with magnetic poles. If it is attached in reverse, the VTR will not operate normally. Attach it correctly following the procedure below.

[How to attach]

* There are holes in the rotor magnet plate and cylinder plate attaching bracket. Attach the rotor magnet plate so that hole (A) in the plate and hole (B) in the bracket across from the screw holdes.

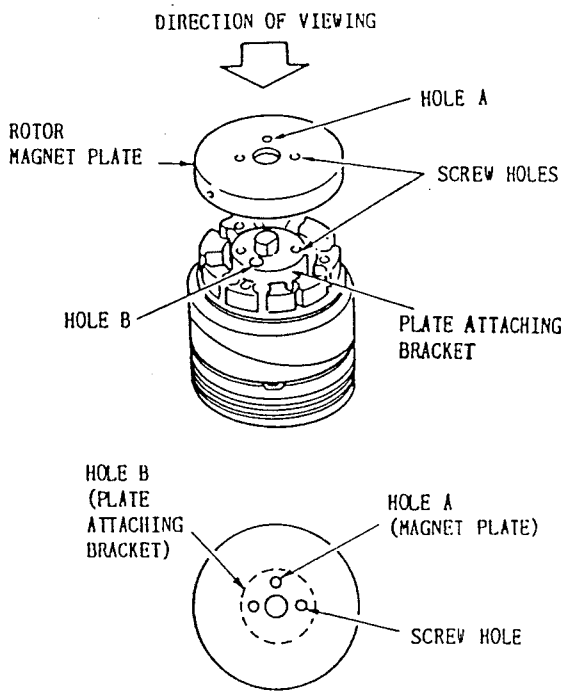


Fig. 7-15 Rotor Magnet Plate Attachment Position

ELECTRIC CIRCUIT ADJUSTMENTS

Test equipment and tapes necessary for adjustment

1) Dual-trace oscilloscope
2) Colour bar generator
3) VTVM
4) DC voltmeter
5) Frequency counter
6) Monitor TV
7) Alignment tapes (MH-2)
8) Blank tape

Cautions on adjustments

1) If there are no special instructions, the following conditions apply:
   - Oscilloscope probe: 10:1
   - Oscilloscope synchronization: Auto-sync
   - Tracking control: Electrical centre

To set tracking to the electrical centre

When "Tracking control:electrical centre" is specified, centre the tracking as follows.

- Press S702 (TRACKING UP) and S706 (TRACKING DOWN) on the main circuit board simultaneously.

2) When making more than one adjustment, make adjustments in the order listed.

Resetting the microprocessors

Since the microprocessors in this uint are backed up for 5 seconds, pull out the mains lead from the AC outlet and re-insert it after 5 seconds to reset the microprocessors.

SERVICING POSITIONS

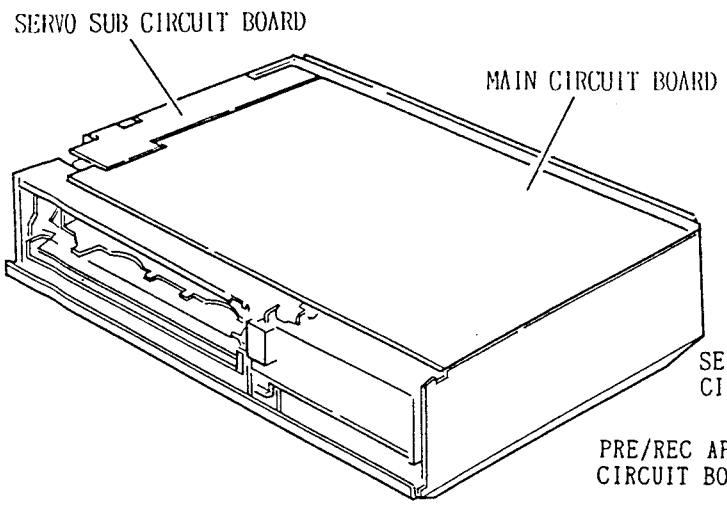


Fig. 3-1 MAIN CIRCUIT BOARD

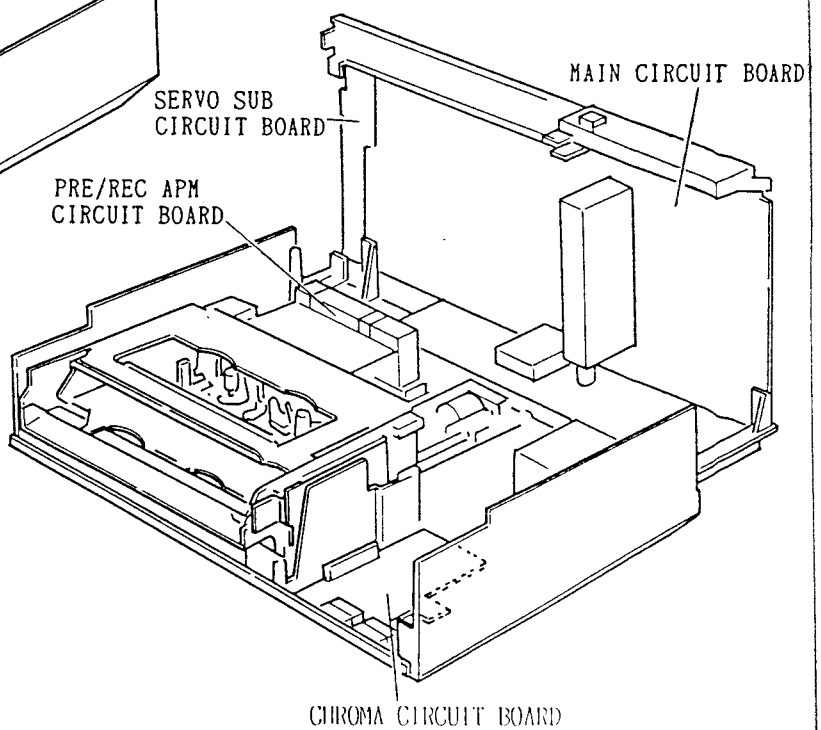


Fig. 3-2 CHROMA CIRCUIT BOARD

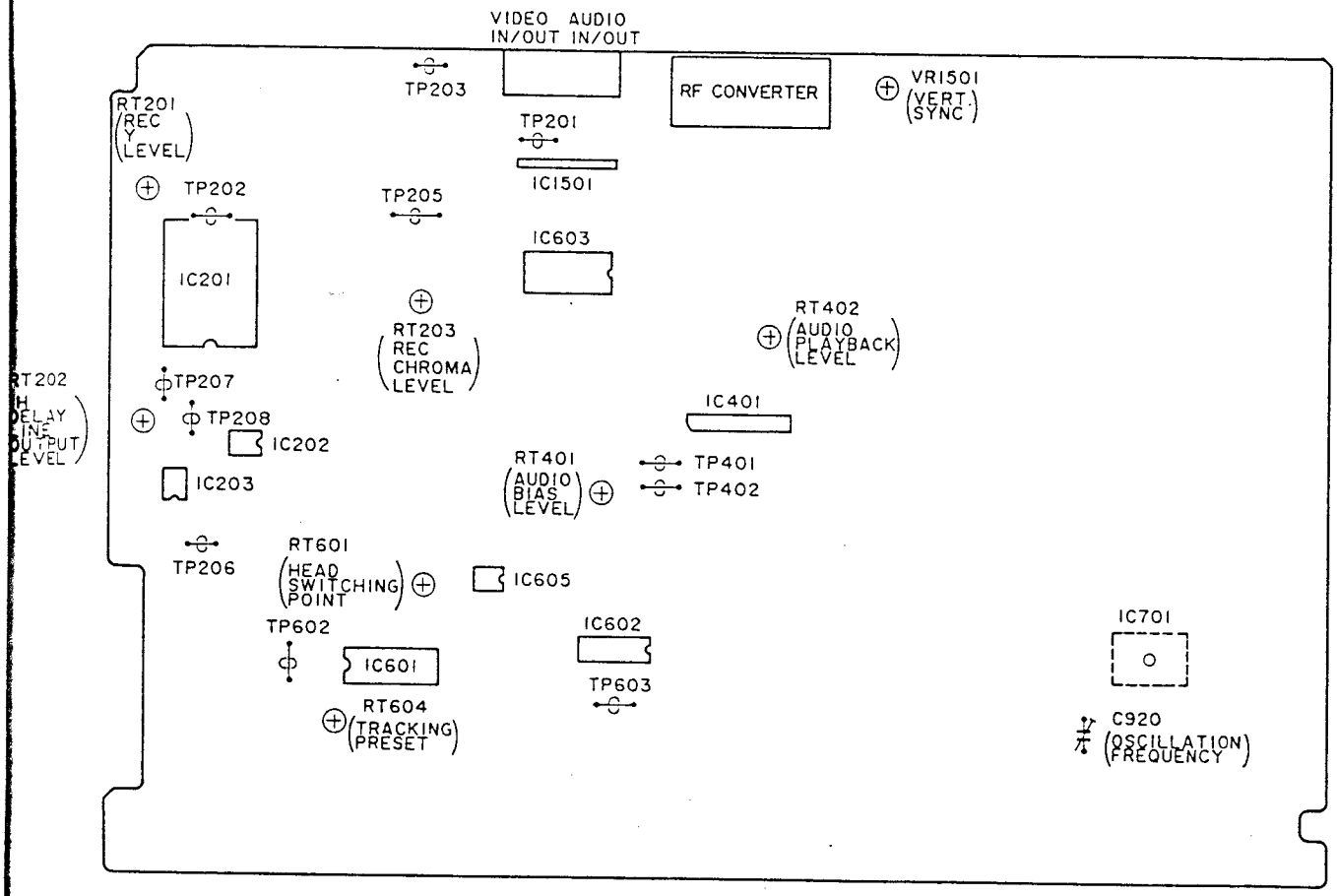


Fig. 3-3 MAIN CIRCUIT BOARD (Solder Side)

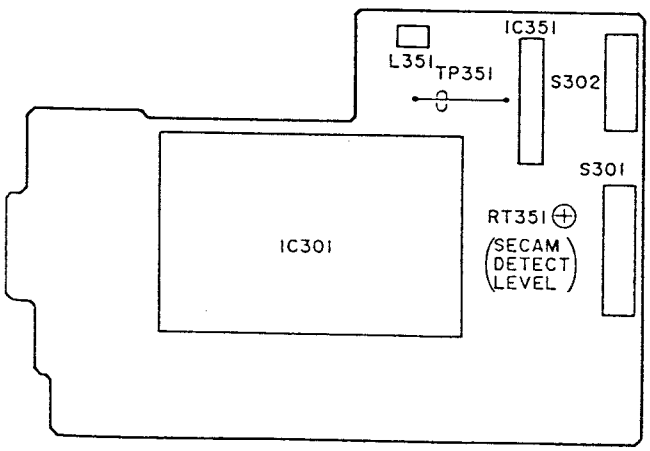


Fig. 3-4 CHROMA CIRCUIT BOARD (Components Side)

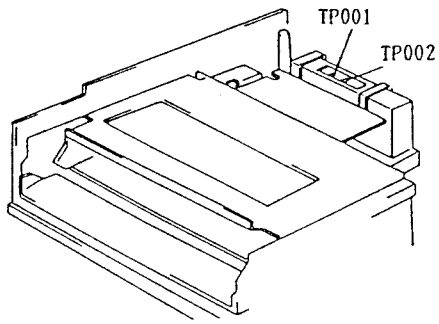


Fig. 3-5 PRE/REC AMP CIRCUIT BOARD

1. SERVO CIRCUIT ADJUSTMENTS

1. Head Switching Point Adjustment

Purpose of adjustment and fault occurring if incomplete

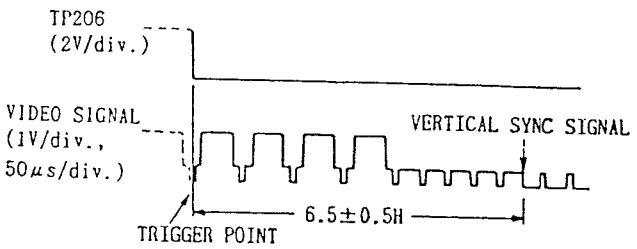
Purpose: Set the video head switching point to almost the centre where the CH-1 and CH-2 envelopes overlap each other during playback.

Fault:
- The vertical sync signal is degraded and vertical jitter occurs.
- Switching noise occurs in lower part of picture.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment point
· Oscilloscope	· CH-1: VIDEO OUT · CH-2: TP206 (SW25Hz)	· COLOUR SYSTEM Select Switch: PAL/MESECAM Position · Playback alignment tape (Stairsteps Section) · Tracking control: Electrical Centre	· RT601
· Alignment tape (MII-2) (Parts No.7099052)			

Adjustment Procedure
(Oscilloscope Settings)
·Set sync slope switch to"-"
·Trigger with CH-2
Vertical sync signal:
6.5H±0.5H from trailing edge(trigger point) of SW25Hz pulse.

Waveforms



2. Tracking Preset Adjustment

Purpose of adjustment and fault occurring if incomplete

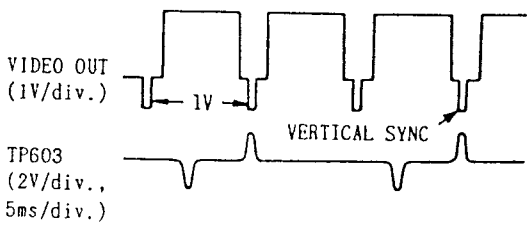
Purpose: Optimize tracking when playing back a tape recorded by this unit.

Fault:
- Noise occurs even with tracking control centred.
- Noise cannot be removed completely when the tracking control buttons are pressed.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
· Oscilloscope	· CH-1: VIDEO OUT · CH-2: TP603 (CTL PULSE)	· COLOUR SYSTEM Select Switch: PAL/MESECAM Position · Record colour bar signal and play it back with this unit. · Tracking control: Electrical Centre	· RT604
· Colour bar generator (or receive TV programme)	· VIDEO IN		
· Blank tape			

Adjustment Procedure
(Oscilloscope Settings)
·Set sync slope switch to"+"
·Trigger with CH-2
Align the phases: Positive peak of the CTL pulse and vertical sync signal.

Waveforms



3. Vert. Sync Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: Change timing for adding vertical drive pulse and suppress vertical jitter in picture during trick play.

Fault: Vertical jitter occurrs during trick play.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
· Monitor TV · Colour bar generator (or receive TV programme) · Blank tape	· RF OUT · VIDEO IN	· COLOUR SYSTEM Select Switch: PAL/MESECAM Position · Record colour bar signal and play it back with this unit in STILL mode.	· VR501

Adjustment Procedure

VR501 : Suppress vertical jitter in picture.

2. Y CIRCUIT ADJUSTMENTS

1. Rec Y/CHROMA Level Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: Set the Y/C record levels to the optimum valuse.

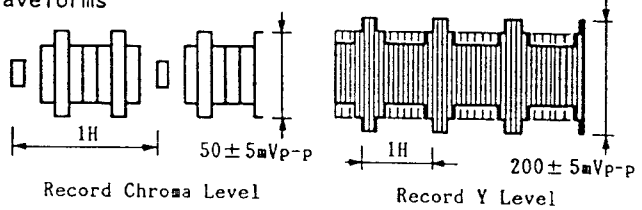
Fault: · Diamond beats occur in the played back picture or colouring becomes poor.
· The played back picture becomes dark and noise increases, or the picture glares and becomes whitish.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
· Oscilloscope · Colour bar generator (or receive TV programme) · Blank tape	· TP001 (on PRE/REC AMP P.C. Board · VIDEO IN	· COLOUR SYSTEM Select Switch: PAL/MESECAM Position · REC mode	· RT203 (REC CHROMA LEVEL) · RT201 (REC Y LEVEL)

Adjustment Procedure

1) Turn the RT201 fully counterclockwise (copper side)
2) RT301: Set the record chroma level to 50±5mVp-p.
3) RT201: Set the record Y level to 200±10mVp-p.

Waveforms



2. 1H Delay Line Level Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: To operate the vertical processor normally.

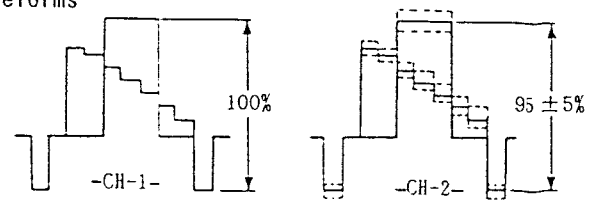
Fault: · Random noise may be conspicuous.
· Dropout may not be compensated.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
· Oscilloscope · Alignment tape (MII-2) (Parts No.7099052)	· CH-1: TP207 (Y) · CH-2: TP208 (DELAY Y)	· COLOUR SYSTEM Select Switch: PAL/MESECAM Position · Playback alignment tape (Colour bars section)	· RT202

Adjustment Procedure

<Oscilloscope setting>
· Trigger with CH-2
RT202: Set the amplitude of CH-2 waveform to 95±5% that of CH-1 waveform.

Waveforms



3. CHROMA CIRCUIT ADJUSTMENT

1. Secam Detect. Level Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose : Set the Secom detect level to the specified value.

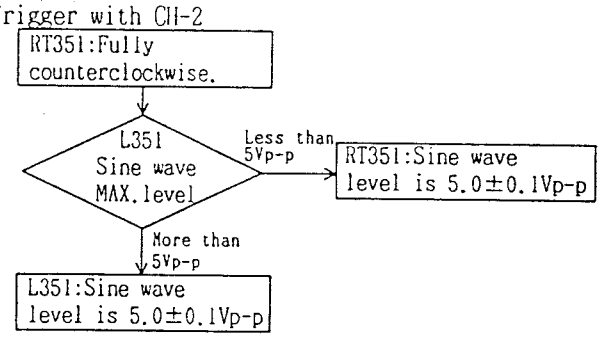
Fault : During automatic discrimination PAL and SECAM are discriminated incorrectly.

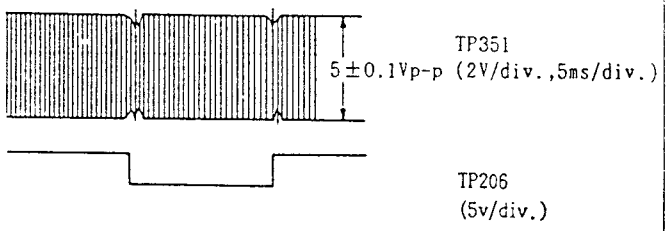
Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Points.
· Oscilloscope	· CH-1: TP351 · CH-2: TP206 (SW25Hz)	· COLOUR SYSTEM Select Switch:PAL/MESECAM Position · REC mode	· RT351 · L351
· SECAM colour bar generator(Full colourbar)	· VIDEO IN		
· Blank tape			

Adjustment Procedure

(Osilloscope Settings)

· Trigger with CH-2





4. AUDIO CIRCUIT ADJUSTMENTS

1. Audio Playback Level Adjustment

Purpose of adjustment and fault occurring of incomplete

Puropse : Set the audio playback level to the specified value.

Faule : When playing back a tape recorded by another VTR, the playback level dos not match.

Tast Equipment/Jigs	Test Equipment Connection Point	VTR State	Adjustment Points.
· VTVM	· AUDIO OUT	· Playback alignment tape(1KHz section)	· RT402
· Alignment tape (MH-2) (Parts No.7099052)			
Adjustment Procedure The VTVM reads -10dBm±0.1dBm.			

2. Audio Bias Level Adjustment

Purpose of adjustment and fault occurring if incomplate

Purpose : Set audio bias during recording to optimum level.

Fault: · Bias too high: High-frequency response deteriorates.
· Bias too low: Sound tends to be distorted.

Tast Equipment/Jigs	Test Equipment Connection Point	VTR State	Adjustment Points.
· VTVM	· TP401(BIAS) · TP402(BIAS GND)	· Non-signal recording	· RT401
· Blank tape			
Adjustment Procedure RT401 : The VTVM reads 2.1mVrms±0.1mVmrs			

5. TIMER CIRCUIT ADJUSTMENT

1. Oscillation Frequency Adjustment

Purpose of adjustment and fault occurring if incomplete

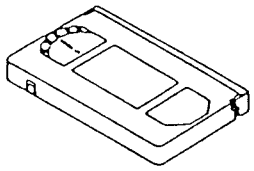
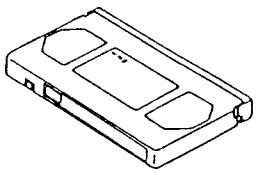
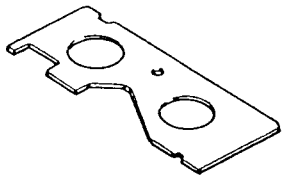
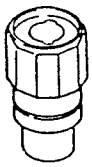
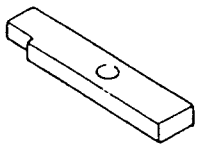
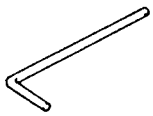
Purpose: Supperss the time gain or lag of the timer less than 0.2 seconds per day.

Fault: · The clock will malfunction.

Tast Equipment/Jigs	Test Equipment Connection Point	VTR State	Adjustment Points.
· Frequency counter	· IC701-74 · IC701-71 (GND)	· Stop mode	· C920
Adjustment Procedure C920 : The frequency counter reads 32,768±2Hz. Note : Be careful when applying an adjustment driver to C716 beacuse the stray capacitance of the driver may vary the frequency.			

ECHANISM ADJUSTMENT

IGS AND TAPES FOR ADJUSTMENT

Back Tension Meter Parts No.7099004 	2. Alignment Tape (MH-2) Parts No. 7099052 	3. Master Plane Parts No.7099279 
Torque Gauge Parts No.7099039 	5. Torque Gauge Adaptor Parts No.7099035 	6. Reel Disk Height Jig Parts No.7099038 
1.5mm Hexagonal Wrench 0.9mm Hexagonal Wrench 		

ECHANICAL PARTS ADJUSTMENT

Mechanism State Switch

rpose: To detect the mechanism state correctly and prevent malfunctions.

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
lank tape	———	· Eject mode (with the cassette ejected)	· Mechanism state switch · Mode gear

justment procedure

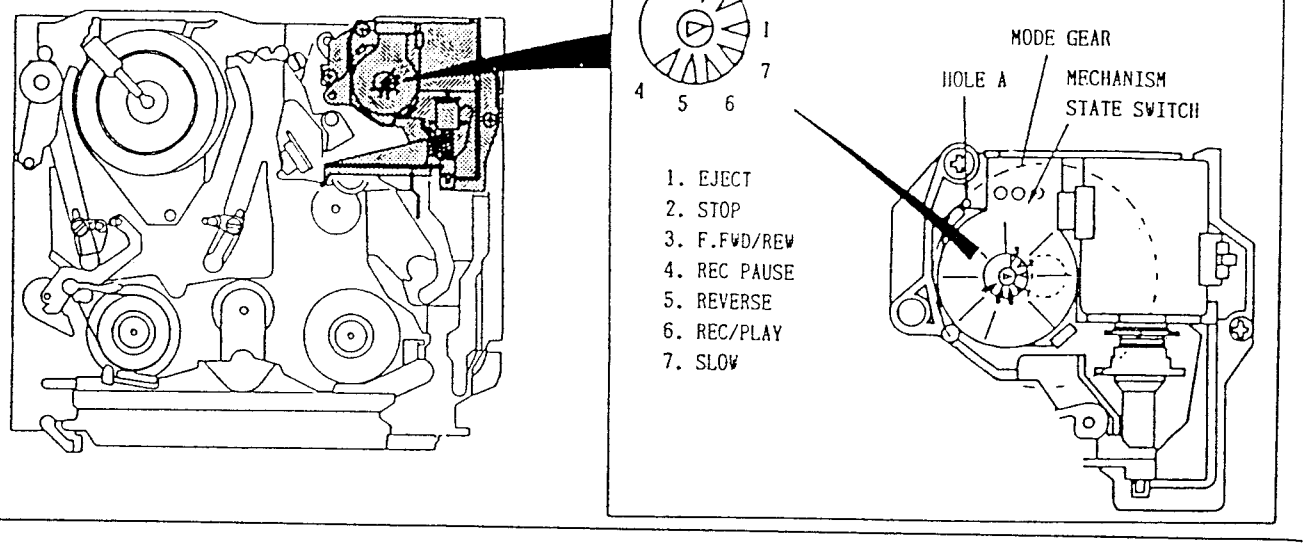
Check that the arrow on the centre shaft of the mechanism state switch points to the arrow of mechanism mode indication number 1. Also check that hole (A) beside the mechanism state switch and the hole in the mode gear are aligned.

If the above alignments are not obtained, adjust as follows.

1. Remove the mechanism state switch/loading motor assembly.
   (See "MAIN MECHANICAL COMPONENTS REMOVAL" in CHAPTER 2.)
2. Move the mode gear to align the position of hole (A).
3. Turn the gear on the back of the mechanism state switch so that the arrow on the centre shaft of the switch points to the arrow of mechanism mode indication number 1.
4. Reinstall the mechanism state switch/loading motor assembly in the above condition.

3) Load a blank tape and perform various operations to check that loading and unloading are performed correctly.

Adjustment diagram



TAPE TRANSPORT SYSTEM PARTS ADJUSTMENT

The tape transport system is the path from the supply reel disk passing through the video heads to the take-up reel disk. The transport system parts, especially the parts which directly come into contact with a tape, should be kept clean without scratches, dust, oil, etc.

The tape transport system has been adjusted before the unit is shipped from the factory. Therefore, when parts in the transport system are replaced, the transport system is stabilized by only adjusting the new parts correctly.

1. Reel Disk Height Adjustment

Purpose: To set the reels of the cassette to the specified height, thus determining the height of tape.

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
· Master plane (Parts No.7099279) · Reel disk height jig (Parts No.7099038)	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	· Spacers in the supply and take-up reel disks

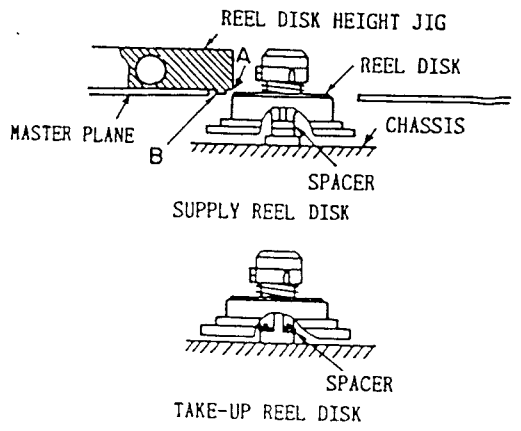
Adjustment procedure

1) Check that the reel disk is between sections A and B of the reel disk height jig.
2) If the disk is not between sections A and B of the jig, replace the spacer (0.5mm thick) in the reel disk or adjust them.

(Caution)

When the tension arm and tension band are removed, adjust the tension pole position and tension after reinstalling them.

Adjustment diagram



Tension Pole Position and Tension Adjustment

urpose: To make the tension of tape constant so that the contact between the video heads and tape is stabilized.

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
sition adjustment ———	———	1) Remove the top cover. 2) Set the VTR to the loading state without inserting a cassette. (See page 4-10)	Position adjustment: Tension band holder
nsion adjustment Back Tension Meter (Parts No.7099004)	———	Tension adjustment 3) Play the tension cassette.	Tension adjustment: Tension spring hooking position

justment procedure

Position Adjustment -

1) Loosen the tension band retaining screw.
2) Insert the tension band holder into one of grooves 1 to 3 and set the gap between the tension pole and chassis to -0.5 to 2mm.
3) Tighten the tension band retaining screw.
4) After adjustment is completed, perform loading without inserting a cassette and recheck the tension pole position.

- Tension Adjustment -

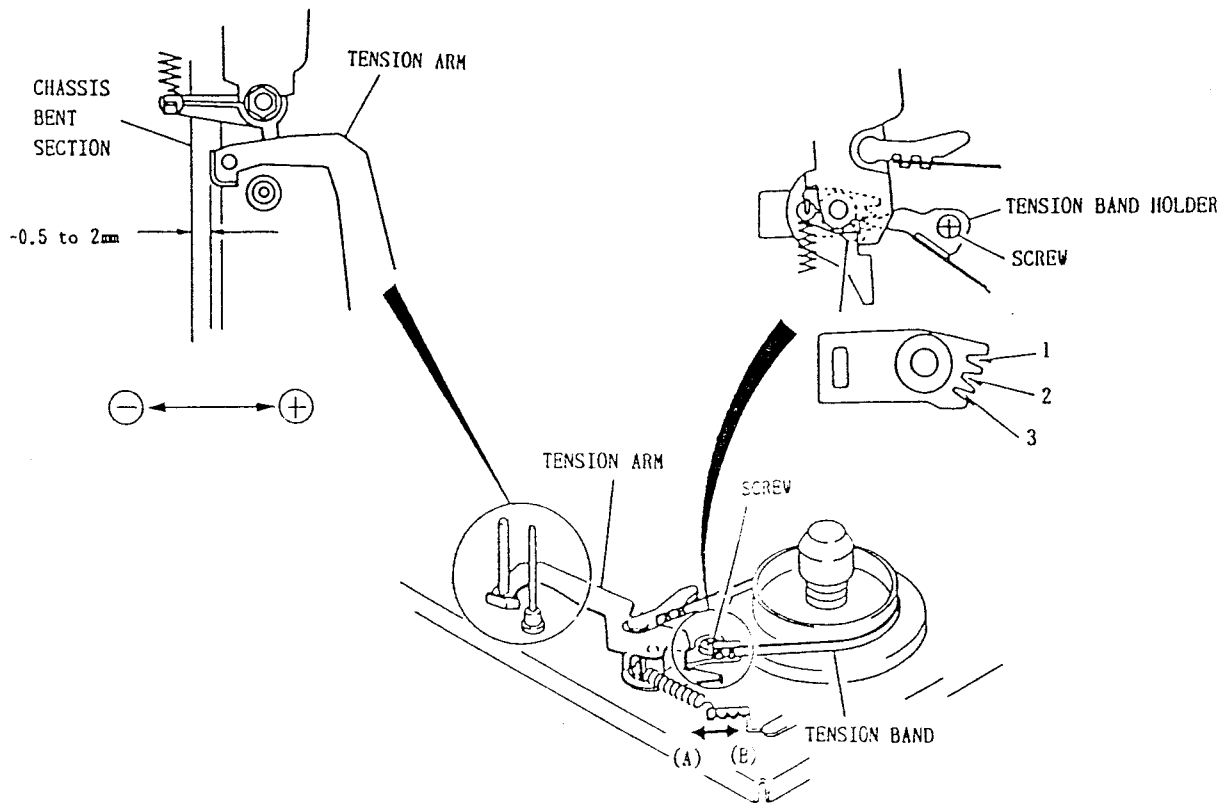
Reading of tension cassette: 34 to 44 g-cm (reference value)

If the reading is higher than the reference, move the spring in direction (A)

If the reading is lower than the reference, move the spring in direction (B).

Caution: When the tension position was changed greatly (more than 6 g-cm), recheck the tension pole position. If it is drifted, readjust the tension pole position and tension.

ustment diagram



3. Guide Pole Height Adjustment

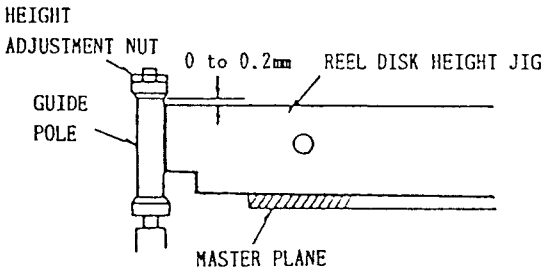
Purpose: To regulate the tape height.

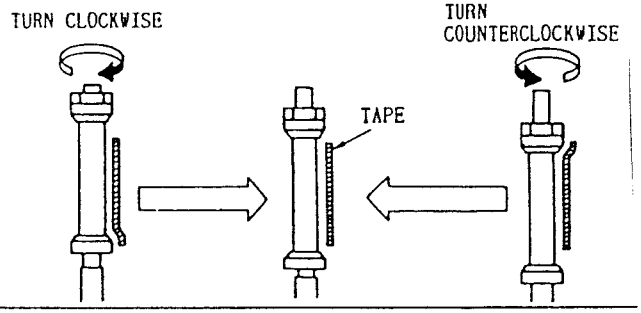
Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
· Master plane (Parts No.7099279) · Reel disk height jig (Parts No.7099038)	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	· Nuts on the supply and take-up guide poles
· Blank tape	——	· Playback mode	

Adjustment procedure

1) Set the clearance between the bottom of the guide pole's upper flange and top of the reel disk height jig is 0 to 0.2mm.
2) Load a blank tape to run it and check that the tape does not ride over the upper and lower flanges of the guide pole.
3) If the tape rides over either flange, adjust the height of guide pole as follows.
   If the tape rides over the upper flange, turn the nut counterclockwise.
   If the tape rides over the lower flange, turn the nut clockwise.

Adjustment diagram





4. Guide Roller Height Adjustment

Purpose: To regulate the height of tape so that the bottom of tape runs along the tape guide line on the cylinder.

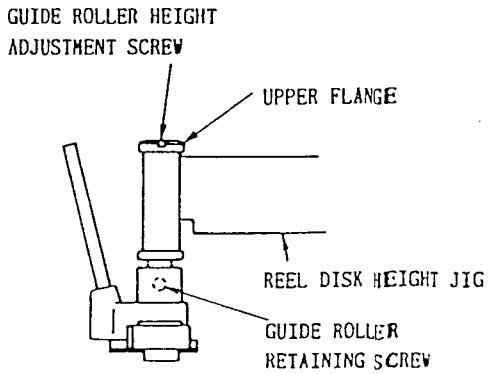
Coarse Adjustment

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
· Master plane (Parts No.7099279) · Reel disk height jig (Parts No.7099038) · 0.9mm Hexagonal wrench	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	Height adjustment screws on the supply and take-up guide rollers

Adjustment procedure

1) Loosen the guide roller retaining screw (so that the guide roller does not turn during loading, unloading and play).
2) Align the bottom of the guide roller's upper flange and the top of the reel disk height jig.
3) Perform the precise adjustment continuously.

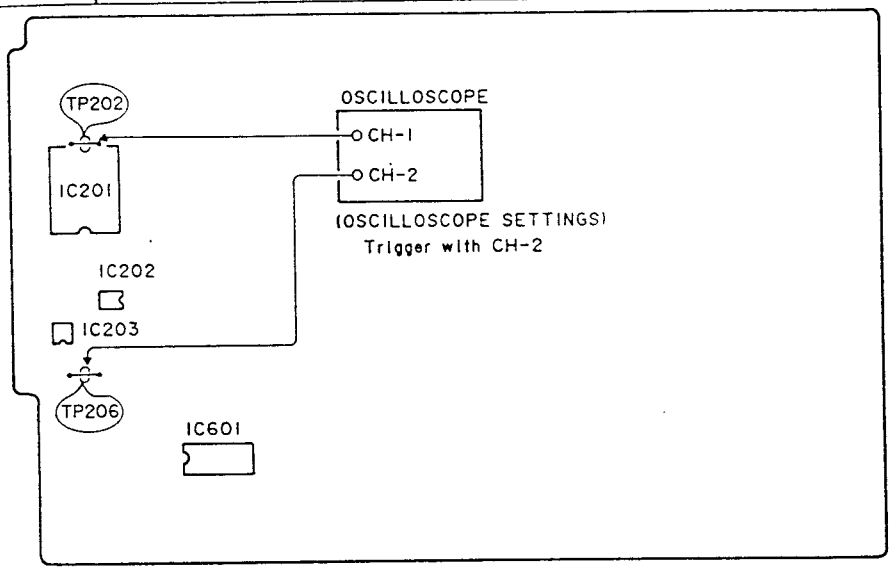
Adjustment diagram



ecise Adjustment

Test equipment/jigs	Test equipment connection points	State of VTR	Adjustment points
Oscilloscope	· CH-1: TP202 (PB FM) · CH-2: TP206 (SW 25Hz)	· Play alignment tape. (Colour bars)	· Guide roller height adjustment screws
Alignment tape (MH-2) (Parts No.7099052) 0.9mm Hexagonal wrench			

Connection diagram



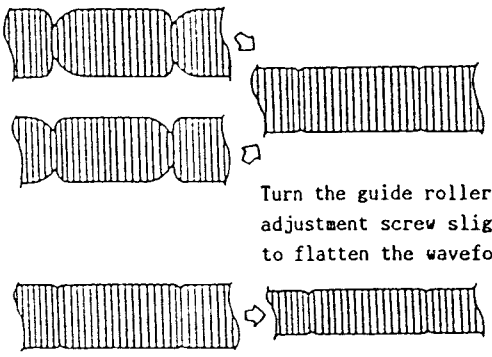
MAIN CIRCUIT BOARD (Solder Side)

Adjustment procedure

Note: To set tracking to the electrical centre
· Press S702 (TRACKING UP) and S706 (TRACKING DOWN) on the main circuit board simultaneously.

1) Tracking control (playback) : Electrical centre position
(when this adjustment is performed after the cylinder has been replaced, set the tracking control so that the FM output is maximum.)
2) Height adjustment screw: Flatten the FM envelope.
3) Press the tracking control up and down buttons.
4) Check that the FM drops at the start and end of FM envelope are uniform.
5) Tighten the guide roller retaining screw.

Waveforms



Turn the guide roller height adjustment screw slightly to flatten the waveform.

Tracking control at centre

Press the tracking control buttons

5. Audio / Control (A/C) Head Adjustment

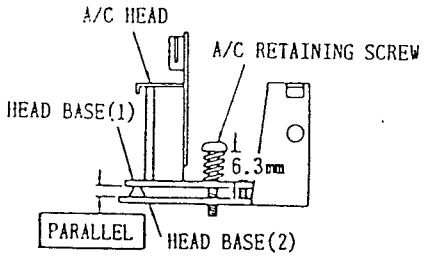
Purpose: To keep the contact between the tape and head even so the specified track is recorded and played back.

Coarse Adjustment

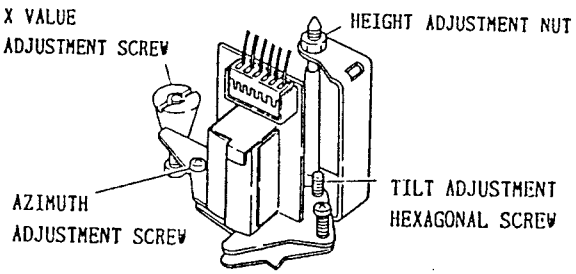
Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
· Master plane (Parts No.7099279) · Reel disk height jig (Parts No.7099038) · 1.5mm Hexagonal wrench	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	———	· A/C head retaining screw · Azimuth adjustment screw · Height adjustment nut · Tilt adjustment screw
· Blank tape	———	· Run the blank tape.	

Adjustment procedure/adjustment diagrams

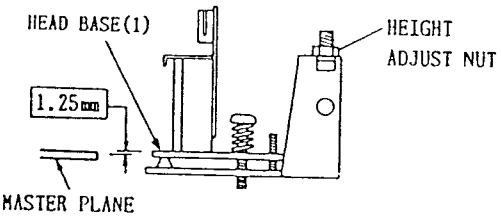
1) A/C head retaining screw: Check that the spring section of the A/C head retaining screw protrudes 6.3mm over the top of head base (1).



2) Tilt adjustment hexagonal screw, azimuth adjustment screw: Make head bases (1) and (2) parallel.

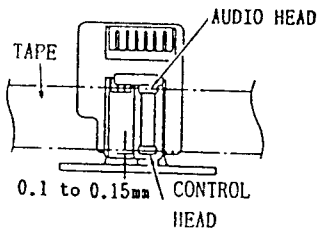


3) Height adjustment nut: Set the clearance between the master plane and head base (1) to approx. 1.25mm



4) Remove the adjustment jigs, load a blank tape and set the VTR to the play mode.

5) Check that there is no conspicuous curling and riding over around the A/C head. If there is conspicuous curling or riding over, readjust the tilt adjustment hexagonal screw, azimuth adjustment screw and height adjustment nut. When the bottom edge of tape is 0.1 to 0.15mm from the bottom edge of the control head's core, the height of A/C head is ideal.



6) Perform the precise adjustment continuosly.

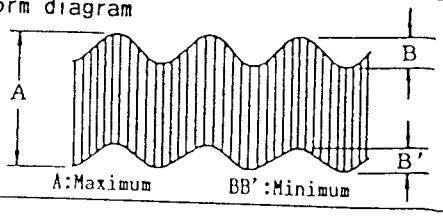
Precise Adjustment

Test equipment/jigs	Test equipment connection point	State of VTR	Adjustment points
· Oscilloscope	· Audio output jack	· Play alignment tape (Stairsteps)	· Azimuth adjustment screw · Height adjustment nut · Tilt adjustment screw
· Alignment tape (MH-2) (Parts No.7099052) · 1.5mm Hexagonal wrench			

Adjustment procedure

1) Adjust the azimuth adjustment screw, height adjustment nut and tilt adjustment hexagonal screw slightly and alternately: Make the audio output maximum and flat (minimum fluctuations).

Waverform diagram



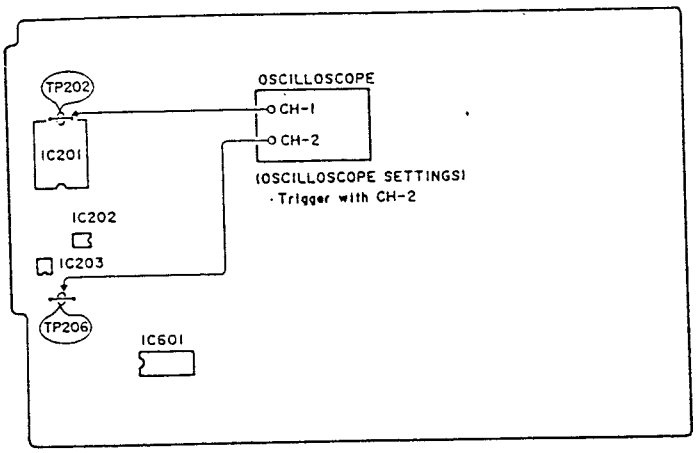
X Value Adjustment

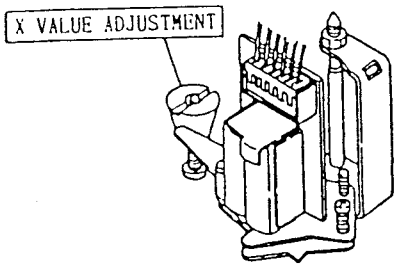
Purpose: To obtain compatibility with other VTRs.

Note: Always perform the tracking preset adjustment (page 3-3) that should be done when the cylinder is replaced before adjusting the X value.

Test equipment/jigs	Test equipment connection points	State of VTR	Adjustment point
Oscilloscope	· CH-1: TP202 (PB FM) · CH-2: TP206 (SW 25Hz)	· Play alignment tape (Stairsteps)	· X value adjustment screw
Alignment tape (MH-2) (Parts No.7099052) 1.5mm Hexagonal wrench	——		

Connection diagram



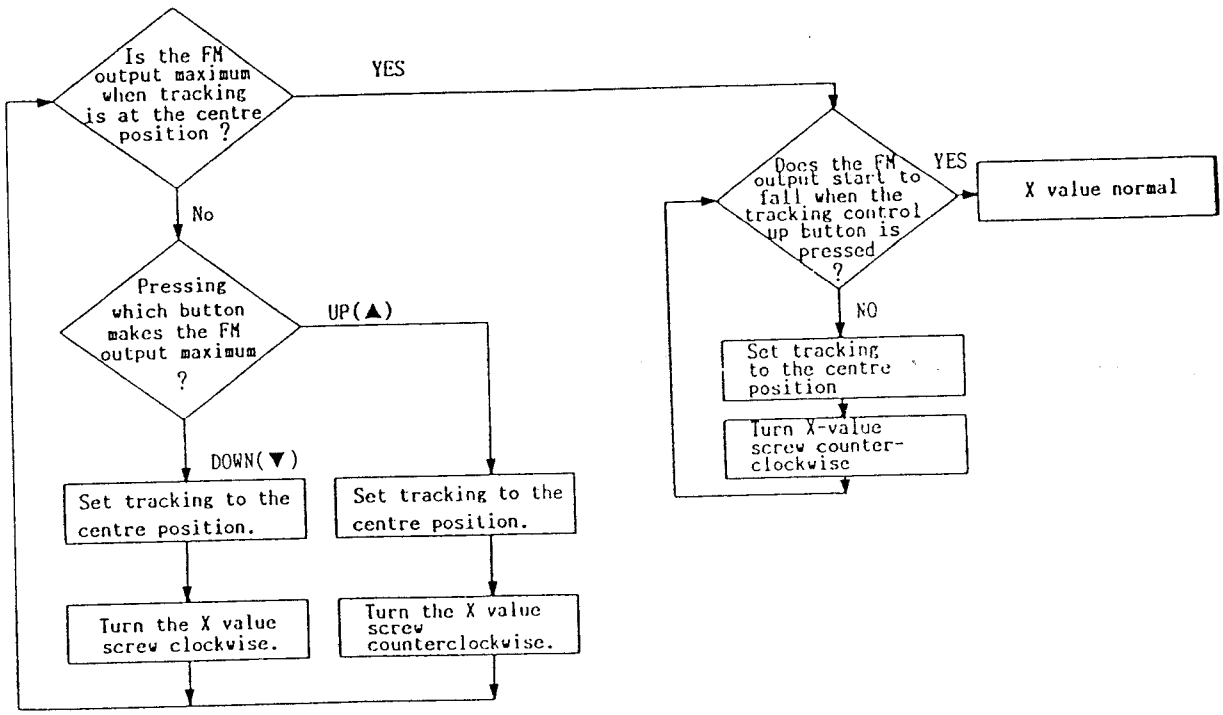


Main Circuit Board (Solder Side)

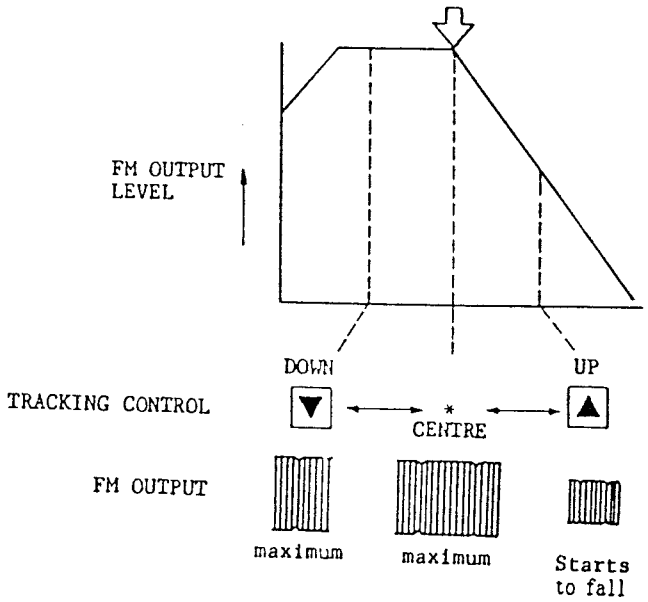
Adjustment procedure

Adjust so that the FM output is maximum when tracking is set to the centre and it starts to fall when the tracking up button is pressed.

Note: To set tracking to the centre
· Press S702 (TRACKING UP) and S706 (TRACKING DOWN) on the main circuit board simultaneously.


Is the FM output maximum when tracking is at the centre position ?
YES
No
Pressing which button makes the FM output maximum ?
UP(▲)
DOWN(▼)
Set tracking to the centre position.
Turn the X value screw clockwise.
Set tracking to the centre position.
Turn the X value screw counterclockwise.
Does the FM output start to fall when the tracking control up button is pressed ?
YES
X value normal
NO
Set tracking to the centre position
Turn X-value screw counter-clockwise

Adjustment diagram

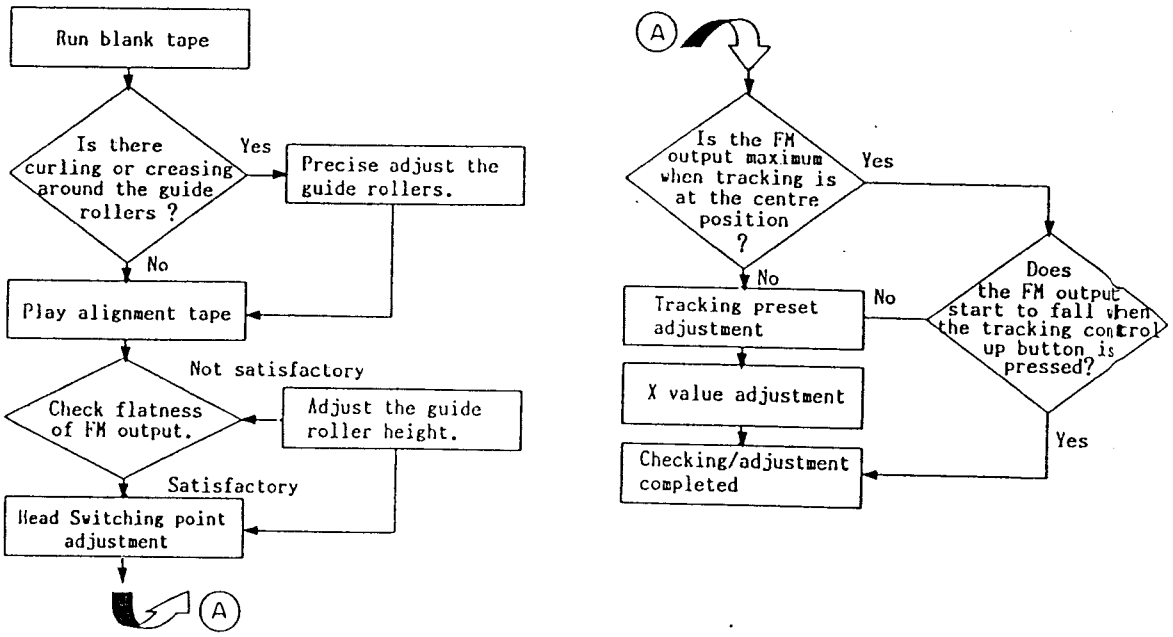


7. Adjustments After Replacing Cylinder (Video Heads)

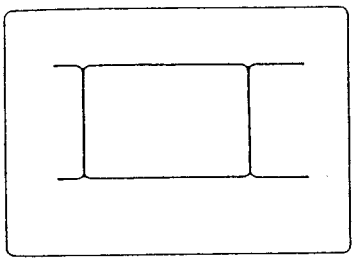
Purpose: To suppress drift in the height relative to the guide roller and to minimize the X value after replacing the cylinder.

Test equipment/jigs	Test equipment connection points	State of VTR	Adjustment points
· Oscilloscope	Checking the flatness · CH-1: TP202 (PB FM) · CH-2: TP206 (SW 25Hz)	· Run the blank tape	· Guide rollers (precise adjustment on page 4-4) · Head Switching point (page 3-3) · Tracking preset (page 3-3) · X value (page 4-7)
· Alignment tape (MH-2) (Parts No.7099052) · Blank tape · 0.9mm/1.5mm Hexagonal wrenches · X value adjustment screwdriver	———	· Play alignment tape (Stairsteps)	

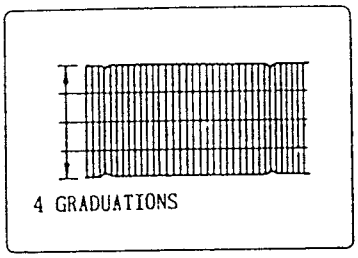
Checking/adjustment procedure



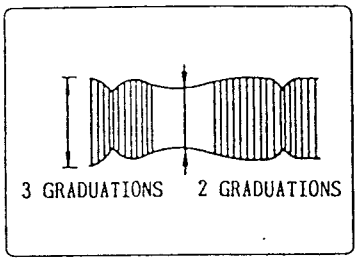
king procedure of the flatness and fluctuations
M output and waveform diagrams
se the tracking control to maximize the FM
utput.



ine tune the voltage level range of the oscil-
oscope to set the FM output to 4 graduations.



3) Press the tracking control buttons to set the maximum amplitude of the FM output to 3 graduations.
4) Check that the mimimum amplitude is more than 2 graduations.



5) Check that the level fluctuations between the maximum and minimum amplitudes are less than 13%.

nsion/Torque Checks

pose: It is necessary to check the tension, torque and compression force at the tape take-up section and moving section to make the tape running smooth and satisfy the basic performance of the VTR. Check these if the tape running is not smooth or the tape speed is abnormal.

Test equipment/jigs	State of VTR
rque gauge rque gauge adaptor	• Set the VTR to each operaion mode without inserting a cassette. (See page 4-10)

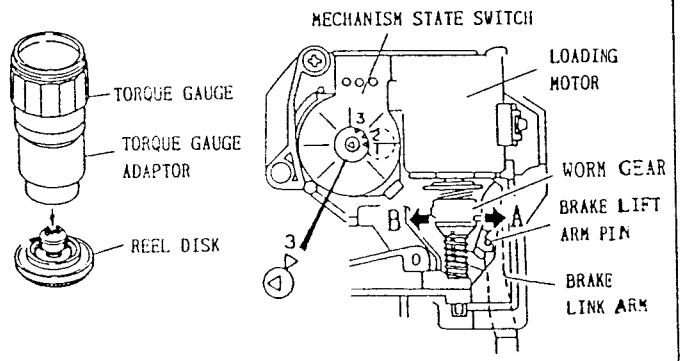
Item	VTR operation mode	Measured reel	Measured value
n brake torque	Stop (Note)	Supply & take-up reels	170 g·cm or more
ck removal torque	Unloading	Supply reel	90 ~ 230 g·cm
t forward torque	Fast forward	Take-up reel	400 g·cm or more
ind torque	Rewind	Supply reel	400 g·cm or more
e-up torque	Play	Take-up reel	80 ~ 170 g·cm
k-tension torque	Fast forward	Supply reel	4 ~ 25 g·cm
	Rewind	Take-up reel	

cking method

values are measured using a torque gauge and a que gauge adaptor with the torque gauge fixed.

ote: Turn the worm gear in the direction of arrow (A) in the stop mode and shift the pointer on the mechanism state switch to "3" so as to apply the main brake to the supply reel disk. Then turn the worm gear in the direction of arrow (B) so that brake link arm is released from the brake lift arm pin. (Set the reel drive idler to the centre position.)

Adjustment diagram



9. To Set the VTR to the Loading State without Inserting a Cassette

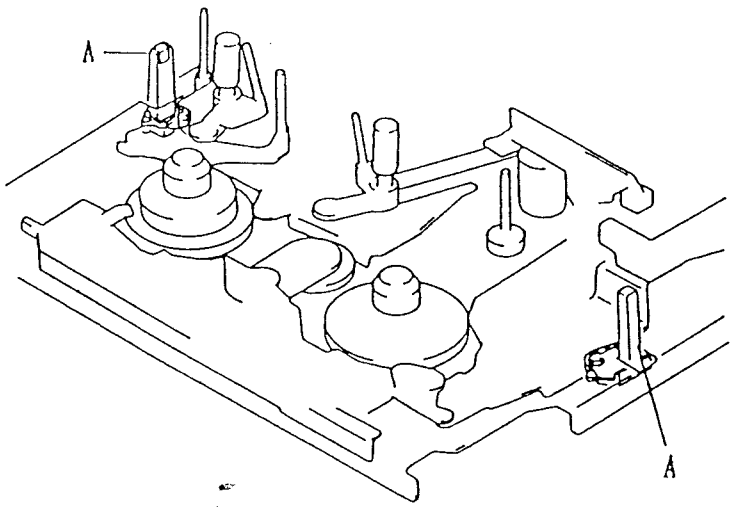
1) Remove the top cover and front panel.
2) Remove the cassette loading mechanism.
3) Unplug the mains lead form the AC outlet.
4) Cover the supply and take-up end sensors (sections A in the figure below) with black masking tape, etc. to shut off the light.
5) Plug the mains lead into the AC outlet.
6) Turn the VTR on.
   The VTR can accept the inputs of each mode in this state. However, the rewind operation cannot be performed for more than a few seconds because the take-up reel disk in the stop state and reel pulses cannot be detected.

(Cautions)

Always return the VTR to the original state in the following order after the above operations have been performed.

1) Remove the masking tape, etc. from the supply and take-up end sensor.
2) Unplug the mains lead from the AC outlet to reset the system control microprocessor.

Adjustment diagram



AINTENANCE/INSPECTION PROCEDURE

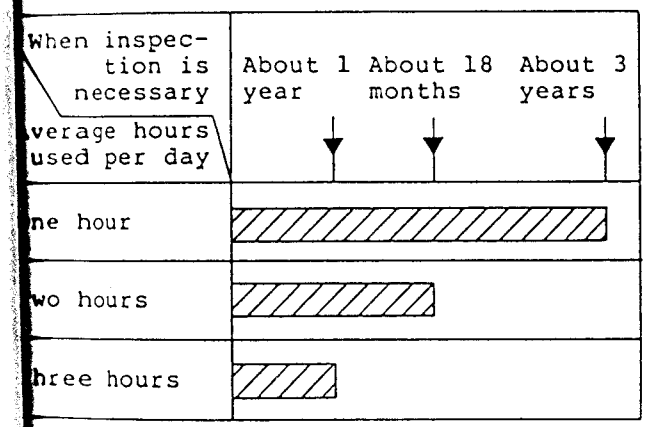
Required Maintenance

he recording density of a VTR is much gher than that of an audio tape corder. VTR components must be very cise, at tolerances of 1/1000 mm, to sure compatible with other VTRs. If y of these components are worn or rty, the symptoms will be the same as the part is defective. To ensure a od picture, periodic inspection and intenance, including replacement of rn-out parts and lubrication, is cessary.

Scheduled Maintenance

hedules for maintenance and inspection e not fixed because they are greatly cording to the way in which the stomer uses the VTR, and the vironment in which the VTR is used. t, in general home use, a good picture ll be maintained if the inspection and intenance is done every 1,000 hours. e table below shows the relation tween time used and inspection period.

Table 1



Check before starting Repairs

e following faults can be remedied by eaning and oiling. Check the need for rication and the conditions of eanliness in the unit. Check with the stomer to find out how often the unit used. If from that you determine that e unit is ready for inspection and intenance, check the following parts.

Table 2

Phenomenon	Inspection Location
Poor S/N, no colour	Dirt on video head or worn video head
Tape does not run or tape is slack	Dirt on pressure roller, reel belt or flywheel belt
Vertical jitter, horizontal jitter	Dirt on video head or in tape transport system
Colour beats	Dirt on full-erase head
Low volume or sound distorted	Dirt on audio/control head
Fast forward or rewind is not done or rotation is slow	Dirt on reel belt

4. Tools Needed for Inspection and Maintenance

(1) Head cleaning kit
(2) VTR oil kit
(3) Alcohol (or freon)
(4) Gauze
(5) Screwdriver for adjusting X-value

Table 3 Locations for Greasing and Oiling using the Kit

Name	Oil or Greasing Location
Pan motor oil (X10W40)	Oil high-speed rotating sections
Sonic Slidas Oil (#1600)	Oil low-speed rotating sections
Hitazol (MO138)	Grease metal parts under heavy lead
Froil (GB-TS-1)	Lubricate metal or molded sections under light load
Lock paint	Fix adjustment screws

The above oils and greases are in the kit prepared especially for VTR maintenance. Use this kit for lubrication.

5. Maintenance Procedures

5-1 Cleaning

(1) Cleaning video head

First use a cleaning tape. If dirt on head is too stubborn to remove by tape, use the cleaning kit. Moisten the cleaning stick with cleaning fluid at the point indicated. Touch the stick to the head tip and gently turn the head (rotating cylinder) to the right and left.
(Do not move the stick vertically and make sure that only the chamois leather on the stick comes into contact with the head. Otherwise, the head may be damaged.)
Thoroughly dry the head. Then test run a tape. If cleaning fluid remains on the video head, the tape may be damaged when it comes into contact with the head surface.

(2) Cleaning the tape transport system and drive system, etc.

Wipe with gauze moistened with alcohol or freon.

Notes:
1) The tape transport system is the system which comes into contact with the running tape. The drive system consists of those parts which run the tape.
2) Make sure that during cleaning you do not touch the tape transport system with the tip of a screwdriver and that no force is applied to the system that could deform it.

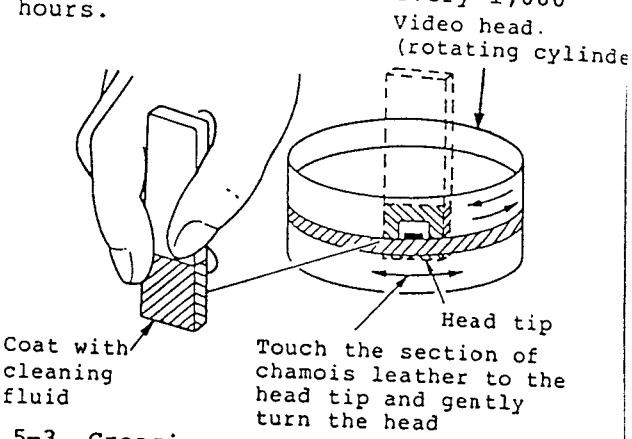
5-2 Lubrication

(1) Guidelines for lubricating with oil

Use the oiler to apply one or two drop pan motor oil or Sonic Slidas oil. Mak sure not to use too much oil because it may spill over or leak out coming into contact with rotating parts and causing slippage or other problems. If too muc oil is applied, wipe clean with alcohol or freon.

(2) Periodic oil lubrication

Oil specified locations every 1,000 hours.


Video head.
(rotating cylinde
Head tip
Coat with cleaning fluid
Touch the section of chamois leather to the head tip and gently turn the head

5-3 Greasing

(1) Greasing guidelines

Apply grease, Hitazol or Froil, with a stick or brush. Do not use excess grease. It may come into contact with the tape transport or drive system. Wi any excess and clean with gauze moisten with alcohol or freon.

(2) Periodic greasing

Grease specified locations every 5,000 hours.

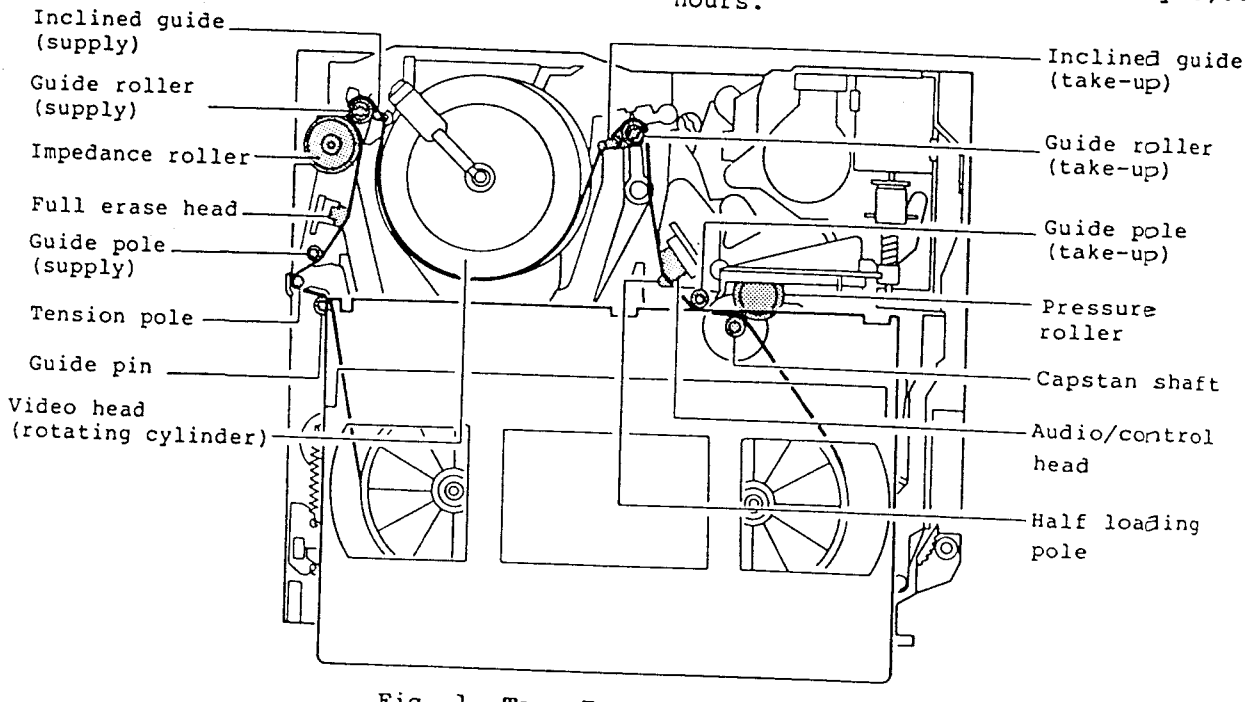


Fig. 1 Tape Transport System

spection Locations

Phenomenon	Inspection Location	Replacement
Poor S/N, no colour	Dirt on video heads	○ (2)
Vertical jitter	Dirt on video heads	○ (3)
	Dirt in tape transport system	
Low volume, sound disordered	Dirt on audio/control head	○ (4)
Tape does not run. Tape is slack.	Dirt on pressure roller	○ (5)

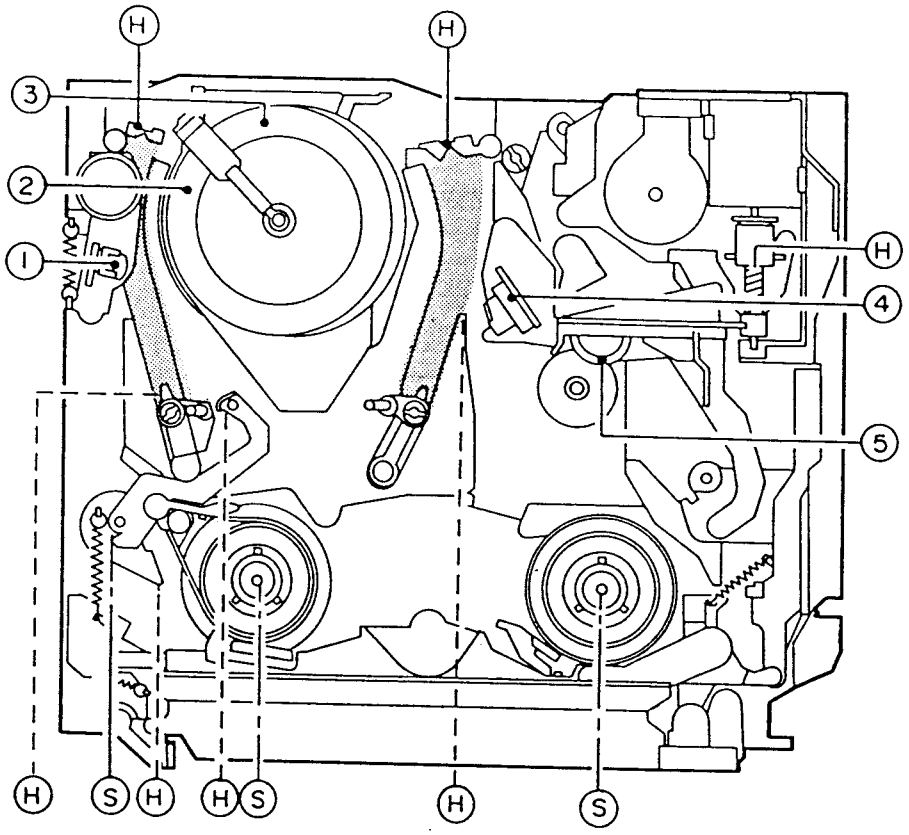


Fig. 2 Top View of Mechanism

Phenomenon	Inspection Location	Replacement
Does not fast fast forward or rewind, or rotation is slow	Dirt on reel belt	○
Tape does not run		
Slack tape		

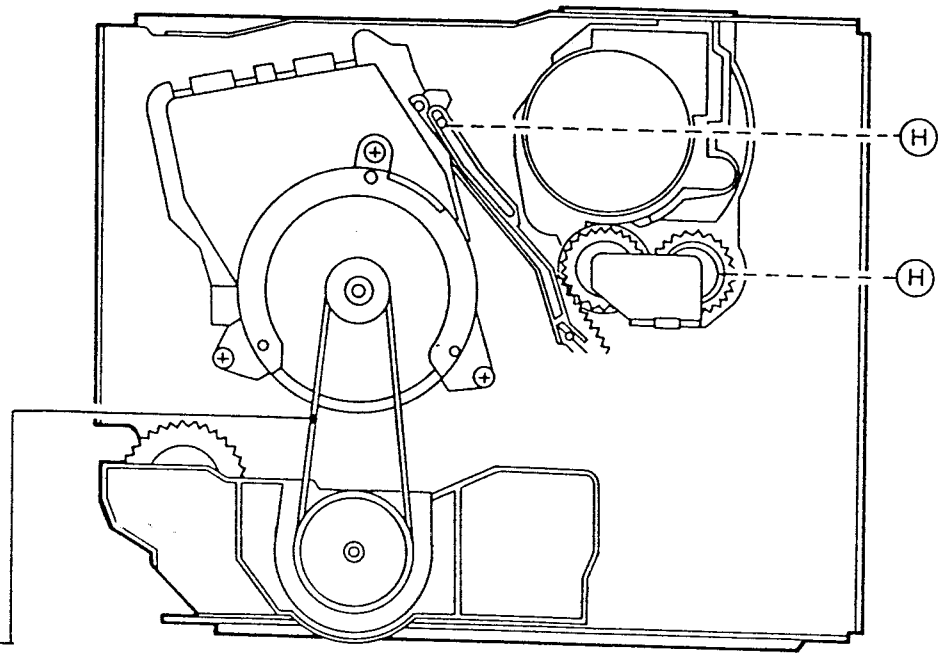


Fig. 3 Bottom View of Mechanism

locations marked with "o" do not
rate normally after cleaning, they
worn. Replace.
the EXPLODED VIEWS at the end of
s manual as well as the above
strations for the sections to be
icated and greased.

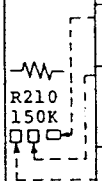
Ⓢ : Sonic Slidas oil (oil locations)
Ⓗ : Hitazol (grease locations)

SCHEMATIC/CIRCUIT BOARD DIAGRAMS

BEFORE USING THIS SERVICE REFERENCE MATERIAL

How to read abbreviations

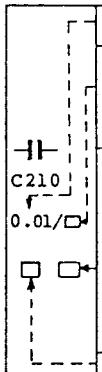
(Resistors)



Value	Not indicated .. Ω(ohm) K ..... kΩ
Tolerance	Not indicated .. ±5% K ..... ±10% M ..... ±20%
Wattage	Not indicated .. 1/8W (All values other than 1/8W are indicated in the schematic diagrams with W omitted)
Sort	Not indicated .. Carbon film RC ..... Carbon solid RW ..... Wire wound RS ..... Metal oxide film RN ..... Metal film

Example:
R120 ..... 150kohm, carbon solid
RC1/2K 1/2W, +10%

(Capacitors)



Value	Not indicated .. μF P ..... PF
Dielectric strength	Not indicated .. 50WV (All values other than 50WV and electrolytic capacitors are indicated in the schematic diagrams with WV omitted)
Tolerance	Not indicated .. ±10% J ..... ±5% M ..... ±20% C ..... ±0.25PF Z ..... +80% -20% (No tolerance is indicated for electrolytic capacitors (excluding tantalum and high stability electrolytic capacitors))
Sort	Not indicated .. Ceramic General electrolytic (distinguished from ceramic with circuit symbol) MYL ..... Mylar (polyester film) STY ..... Styrol TA ..... Tantalum KU ..... High stability electrolytic MP ..... Metalized paper

Example: C210
0.01/25 ... Mylar, 0.01μF, 25WV, ±5%
MYL J

Notes:

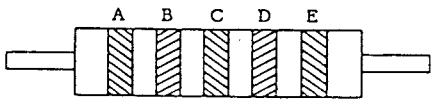
1. Voltages are measured with the negative ⊖ terminal of the power supply as reference in the normal operating mode. The voltages in different modes are indicated in the schematic diagrams; those in parentheses ( ) are in the record mode and those without parentheses are in the play mode.
2. The value, dielectric strength (wattage), tolerance and sort of resistors (excluding variable resistors, etc.) and capacitors are indicated in the schematic diagrams by abbreviations. Replace them correctly, comparing the abbreviations in the schematic diagrams and the table "how to read abbreviations".

Cautions on use of MOS IC

1. The MOS IC is inserted in black foam for shipment. This foam is a conductor which short-circuits between the leads to prevent damage. Do not remove ICs from this foam during their storage. Avoid removing ICs from this foam, placing them on plastic which is likely to be charged with static electricity or inserting them into styrol foam.
2. High voltages may be applied during soldering caused by leakages from the soldering iron, so be sure to ground the tip of the soldering iron or use a low voltage soldering iron.
3. The human body, clothes made of synthetic fibres or nylon gloves may be charged with several thousands volts of static electricity because of friction, so a worker should be earthed.
4. Be sure to earth measuring instrument such as oscilloscopes, VTVMs, etc. used for repairs.

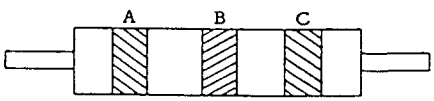
How to read capacity and inductance of resistor shape capacitors and coils

CAPACITOR



CAPACITY: (10A+B) x C (PF)
TOLERANCE: D
RATED VOLTAGE: BODY COLOUR
PINK: 25V
GREEN: 50V
CHARACTERISTICS: E

COIL



INDUCTANCE: (10A+B) x C (μH)

COLOUR	A,B	C	D	E
Black	0	10^0	±20%	For temperature compensation
Brown	1	10^1		
Red	2	10^2		
Orange	3	10^3		
Yellow	4	10^4		
Green	5	10^5		
Blue	6			
Violet	7			
Grey	8		±30%	High dielectric constant type
White	9			For temperature compensation
Gold		10^{-1}	±5%	
Silver		10^{-2}	±10%	High dielectric constant type

SERVICE MANUAL ABBREVIATION LIST

A	
A.DUB	Audio Dub
ACC	Automatic Colour Control
ACK	Automatic Colour Killer
ADD	Adder
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ALC	Automatic Level Control
ASBL	Assemble (Phase Matching)
APC	Automatic Phase Control
AUX	Auxiliary
B	
BATT.	Battery
BG	Burst Gate
BGP	Burst Gate Pulse
BH	Power Supply for Selecting VHF High Band
BL	Power Supply for Selecting VHF Low Band
BPF	Band- pass Filter
BS	Power Supply for Selecting VHF Super Band
BU	Power Supply for Selecting UHF Band
BUF.	Buffer Amplifier
C	
C	Chroma
CFG/CFG	Capstan Frequency Generater
CMEMORY	Counter Memory
CPAUSE	Camera Pause
CRESET	Counter Reset
CREVERSE	Count Reverse
CSYNC	Composite Synchronizing Signal
C/R	Capacitor/Resistor
CTV	Cable TV
CAPST.	Capstan
CCD	Charge Coupled Device
CH	Channel
CHR.	Character
COM.	Common
C-EXP	Compressor-Expander
COMP.	Comparator
COMPE	Compensator
COMP.	Composite
CNT.	Counter
CS	Cassette
CTL	Control Track Pulse
CYL	Cylinder
D	
D/A	Digital to Analog
DEEMPH.	Deemphasis
DEM.	Demodulator
DET	Detector
DISP	Display
DL	Delay line
DN	Down
DO	Dropout

DOC	Dropout Compensator
E	
E-E	Electronic-to-Electronic
EA-ROM	Electrically Alterable Read Only Memory
EMPH	Emphasis
EQ	Equalizer
EXT.	External
F	
FF	Flip Flop
F.FWD	Fast Forward
FG	Frequency Generator
FM	Frequency Modulation
FRAME ADV./F.ADV	Frame Advance
fsc	Sub Carrier Frequency
FWD	Forward
G	
GEN	Generator
GND	Ground
H	
HD	Horizontal Drive
Hi-Fi	High Fidelity
HPF	High-pass Filter
HPL	High-pass Limiter
HSS	Horizontal Sync. Separator
I	
I/O	In/Out
IF	Intermediate Frequency
INDI.	Indicator
INT.	Internal
INV.	Inverter
IR	Infrared Rays
IRT	Instant Recording Timer
L	
LCD	Liquid Crystal Display
LIN.	Linear
LM	Loading Motor
LOG.	Logarithm
LPF	Low-pass Filter
L/R	Left/Right
LP	Long play
M	
M.CUT	Monitor Cut
M.STATE	Mechanism State
M.STOP	Memory Stop
MEM.	Memory
MIX	Mixer
MM	Monostable Multivibrator
MOD.	Modulator
MPX	Multiplex
N	
NF	Negative Feed Back
NORM.	Normal
NR	Noise Reduction

O	
OSC	Oscillator
OSD	On-Screen Display
P	
PB/PLAY	Playback
PIF	Picture Intermediate Frequency
PLL	Phase Locked Loop
POS.	Positive
POWER CONT.	Power Control
PROG.	Programme
PROTECT.	Protector
PWM	Pulse Width Modulation
R	
REC	Record
RECT.	Rectifier
REF	Reference
REG	Regulator
REV	Reverse
REW	Rewind
RF	Radio Frequency
RAM	Randum Access Memorey
ROM	Read Only Memory
S	
S/H	Sample and Hold
S.REEL	Supply Reel Sensor
S.TRACK.	Slow Tracking
S-VHS	Super VHS
SAW	Sawtooth
SEP.	Separator
SIF	Sound Intermediate Frequency
SP	Standard Play
SRCH	Search
SRV	Servo
SW 25Hz	Head Switching Pulse
SYNC	Synchronizing Signal
SYS.CON	System Control
T	
T/L	Tuner/Line
T.BRAKE	Take-up Brake
TμP	Timer Microprocessor
T.REEL	Take-up Reel Sensor
T.RESET	Timer Reset
TP	Test Point
TRS	Transfer
TU-μP	Tuning Microprocessor
U	
U/D	Up/Down
UNI.	Unified
V	
V-REF	Voltage Reference
V.DRV	Vertical Drive Pulse
V.DUB	Video Dub
VCO	Voltage Controlled Oscillator
VHS	Video Home Systems
Vss	Voltage Super Source
VOL.	Volume
VSS	Vertical Sync. Separator
VT	Tuning Voltage
VT-U	Tuning Voltage-UHF
VT-V	Tuning Voltage-VHF
Y	
Y/C	Luminance/Chrominance

DIGITAL PROCESS CIRCUIT

A	
ADC B-Y	Analog to Digital Converted B-Y Signal
ADC R-Y	Analog to Digital Converted R-Y Signal
ADC Y	Analog to Digital Converted Luminance
ADRS	Address
C	
CAS	Column Address Strobe
C.BLANK	Chroma Blanking
D	
DRAM	Dynamic Random Access Memory
DEMPX	Demultiplexer
DWC	Delayed Write Clock
DT/OE	Date Transfer /Output Enable
D.REF 25	Delayed Reference 25Hz
D.SW 25	Delayed Switching 25Hz
I	
INC	Row Counter Increment
M	
MEM	Memory
MEM VIDEO	Memorized Video
MEM SW	Memory Switch
MEM ON	Memory ON
MPX	Multiplexer
MPX VIDEO	Multiplexed Video
O	
O/E	Odd/Even Field
P	
P IN P	Picture in Picture
PIX MOVE	Picture Move
R	
RC	Reading Clock
RCC	Reading Clock Clear
RCR	Row Counter Reset
RAS	Row Address strobe
REF 25	Reference 25Hz from servo circuit
REL	Refresh Control
S	
SC	Serial Control
W	
WC	Write Clock
WCC	Write Clock Clear
WRITE ENBL (WE)	Write Enable

O	
OSC	Oscillator
OSD	On-Screen Display
P	
PB/PLAY	Playback
PIF	Picture Intermediate Frequency
PLL	Phase Locked Loop
POS.	Positive
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PROG.	Programme
PROTECT.	Protector
PWM	Pulse Width Modulation
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REC	Record
RECT.	Rectifier
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REW	Rewind
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RC	Reading Clock
RCC	Reading Clock Clear
RCR	Row Counter Reset
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REF 25	Reference 25Hz from servo circuit
REL	Refresh Control
S	
SC	Serial Control
W	
WC	Write Clock
WCC	Write Clock Clear
WRITE ENBL (WE)	Write Enable

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OSC	Oscillator
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RCC	Reading Clock Clear
RCR	Row Counter Reset
RAS	Row Address strobe
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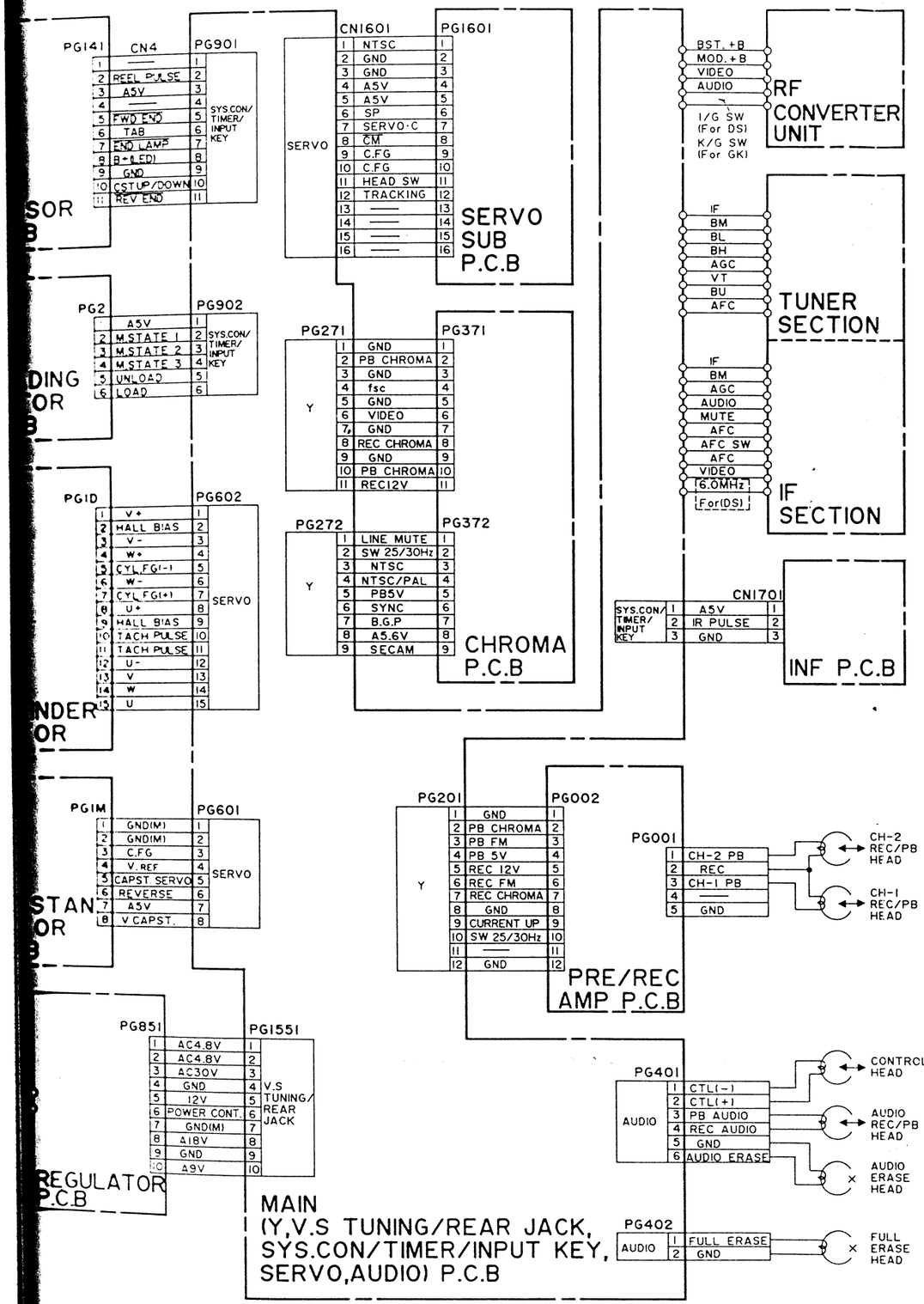
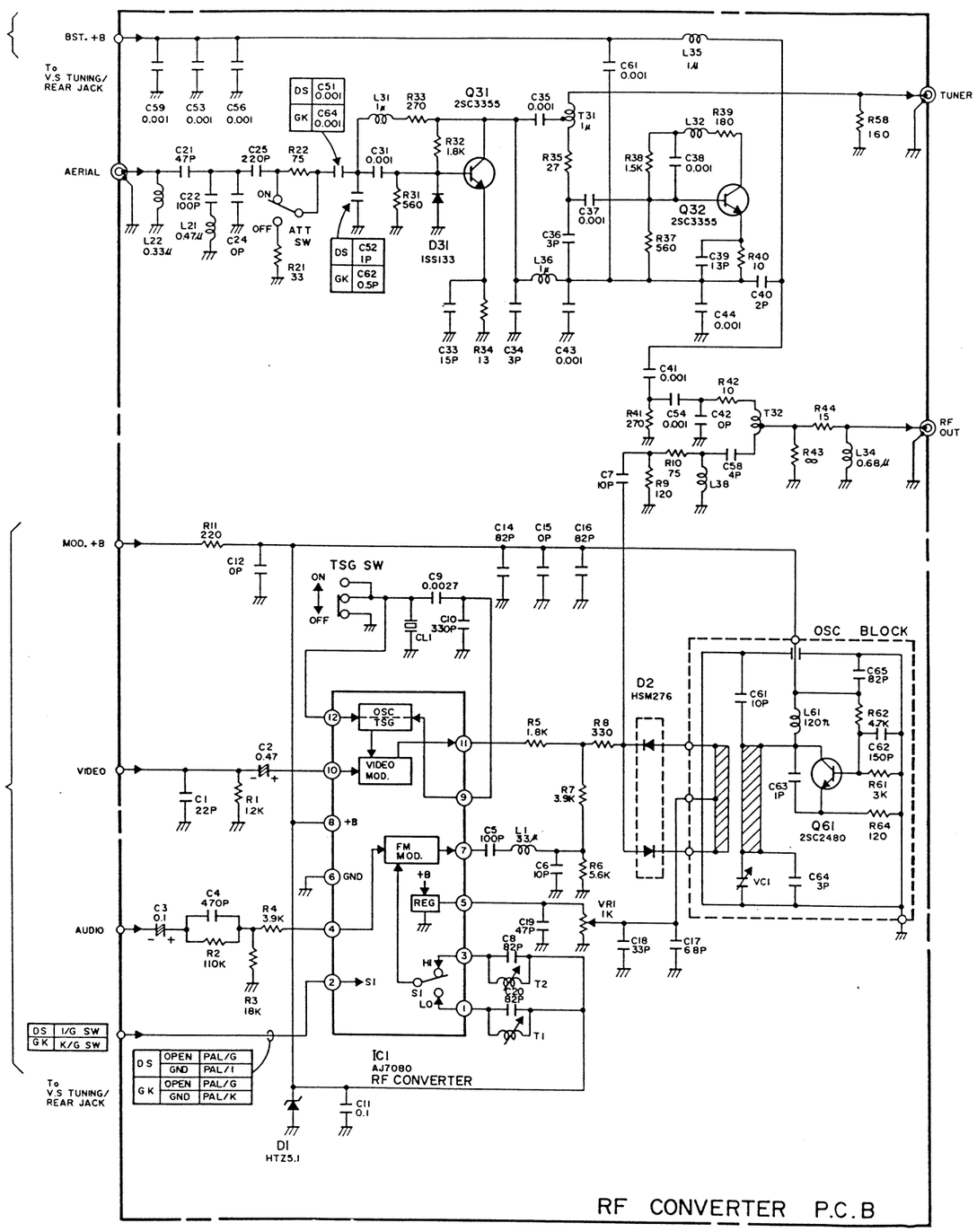
REL	Refresh Control
S	
SC	Serial Control
W	
WC	Write Clock
WCC	Write Clock Clear
WRITE ENBL (WE)	Write Enable

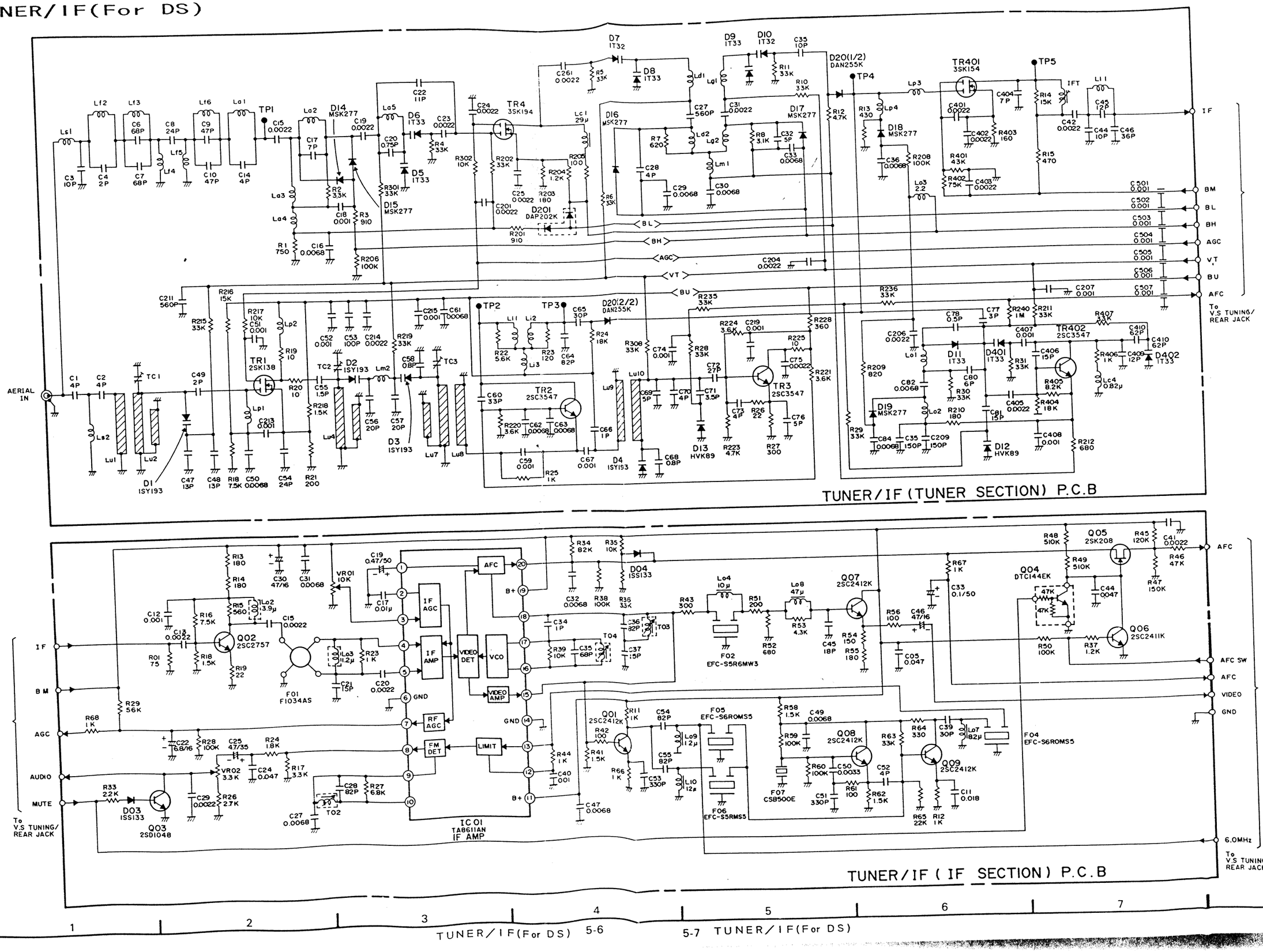
INTERNAL WIRING DIAGRAM

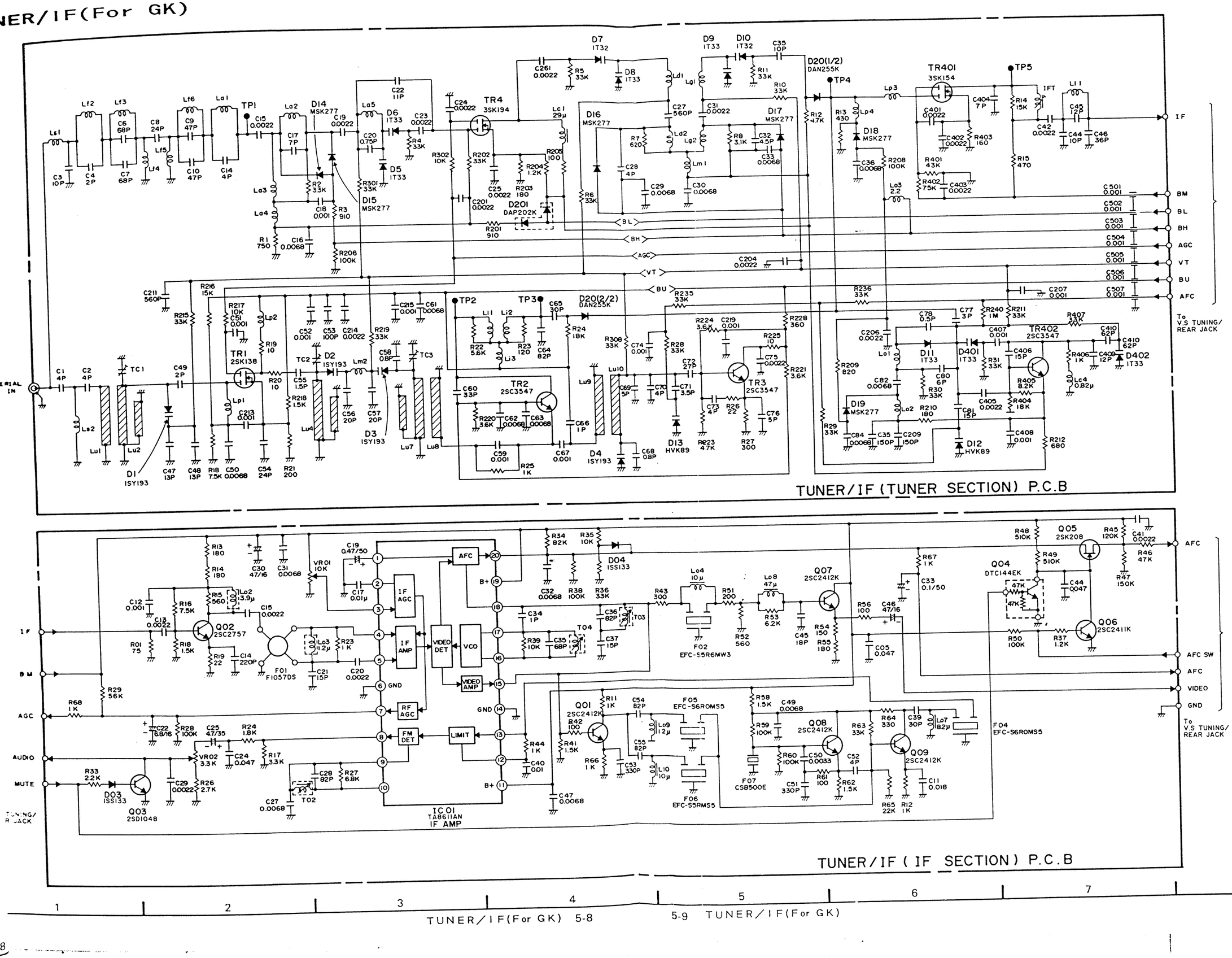


RF CONVERTER



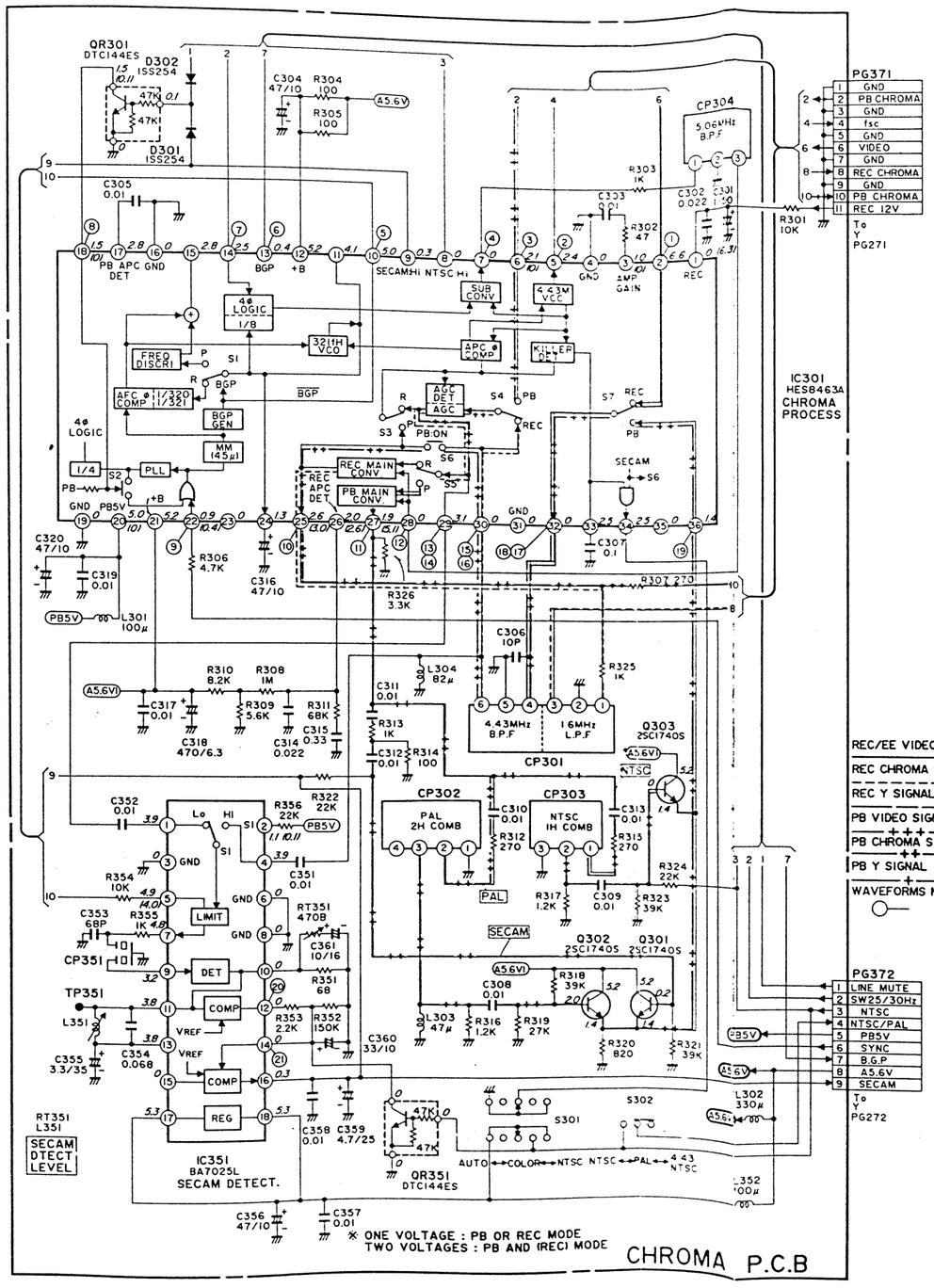
TUNER/IF(For DS)



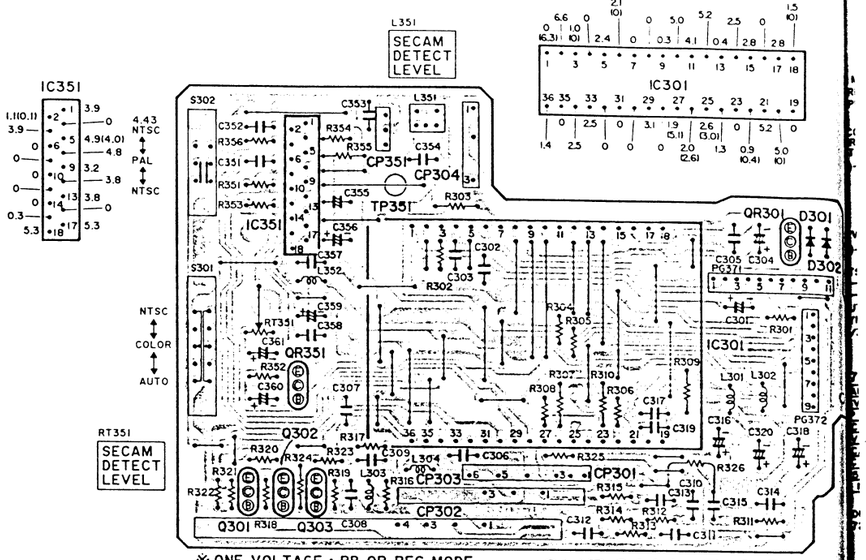

TUNER/IF (TUNER SECTION) P.C.B
TUNER/IF (IF SECTION) P.C.B
AERIAL IN
IF
BM
AGC
AUDIO
MUTE
TUNING/ P.JACK
BL
BH
AGC
VT
BU
AFC
To V.S TUNING/ REAR JACK
AFC SW
VIDEO
GND
IC01 TA8611AN IF AMP
F01 F1057DS
F02 EFC-S5R6MW3
F04 EFC-S6ROMS5
F05 EFC-S6ROMS5
F06 EFC-S5RMS5
F07 CSB500E
D1 1SY193
D2 1SY193
D3 1SY193
D4 1SS133
D5 1T33
D6 1T33
D7 1T32
D8 1T33
D9 1T33
D10 1T32
D11 1T33
D12 HVK89
D13 HVK89
D14 MSK277
D15 MSK277
D16 MSK277
D17 MSK277
D18 MSK277
D19 MSK277
D20(1/2) DAN255K
D20(2/2) DAN255K
D201 DAP202K
D401 1T33
D402 1T33
D03 1SS133
TR1 2SK138
TR2 2SC3547
TR3 2SC3547
TR4 3SK194
TR401 3SK154
TR402 2SC3547
Q01 2SC2412K
Q02 2SC2757
Q03 2SD1048
Q04 DTC144EK
Q05 2SK208
Q06 2SC2411K
Q07 2SC2412K
Q08 2SC2412K
Q09 2SC2412K

CHROMA

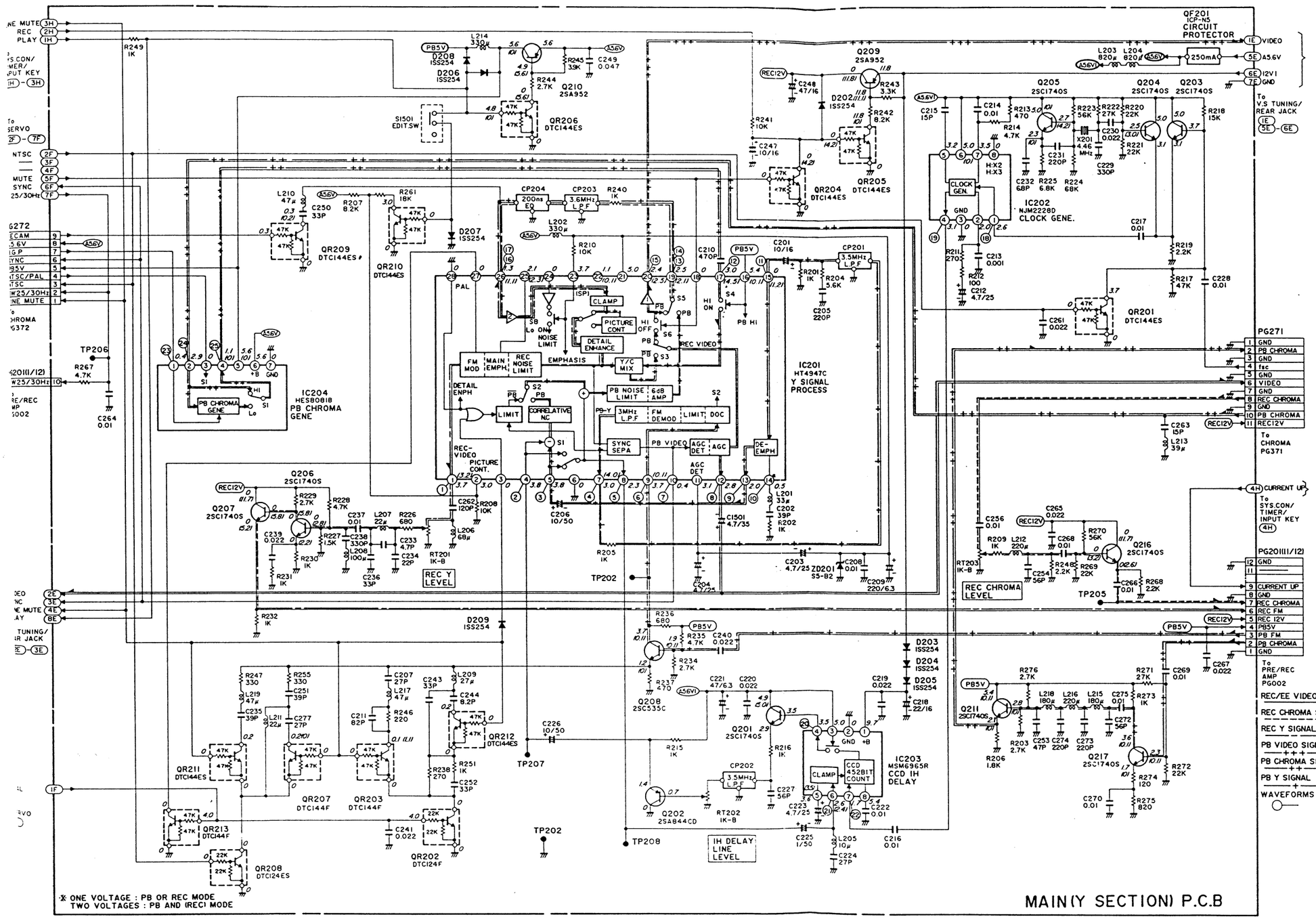
	1 IC301-2 0.2V/20μs 1Vp-p REC	13 IC301-29 0.2V/20μs 640mVp-p REC
	2 IC301-5 50mV/200ns 230mVp-p REC/PLAY	14 IC301-29 0.1V/20μs 300mVp-p PLAY
E	3 IC301-6 0.1V/20μs 300mVp-p PLAY	15 IC301-30 50mV/20μs 240mVp-p REC
	4 IC301-7 0.5V/20μs 1Vp-p REC/PLAY	16 IC301-30 0.2/20μs 640mVp-p PLAY
D	5 IC301-10 2V/20μs 5.4Vp-p REC/PLAY	17 IC301-32 0.2V/20μs 1.1Vp-p REC
	6 IC301-13 2V/20μs 5.4Vp-p REC/PLAY	18 IC301-32 0.5V/20μs 1.6Vp-p PLAY
C	7 IC301-14 1V/5ms 5.1Vp-p REC/PLAY	19 IC301-36 50mV/20μs 200mVp-p PLAY
	8 IC301-18 0.5V/20μs 2Vp-p REC PLAY	20 IC351-12 1V/20μs 23Vp-p REC/PLAY
	9 IC301-22 1V/ 20μs 4.8Vp-p REC/PLAY	21 IC351-14 2V/20μs 5.3Vp-p REC/PLAY
B	10 IC301-25 0.2V/20μs 1.1Vp-p PLAY	
	11 IC301-27 0.2V/20μs 1Vp-p PLAY	
	12 IC301-28 50mV/20μs 200mVp-p REC/PLAY	
A		



PRE/REC AMP



Y

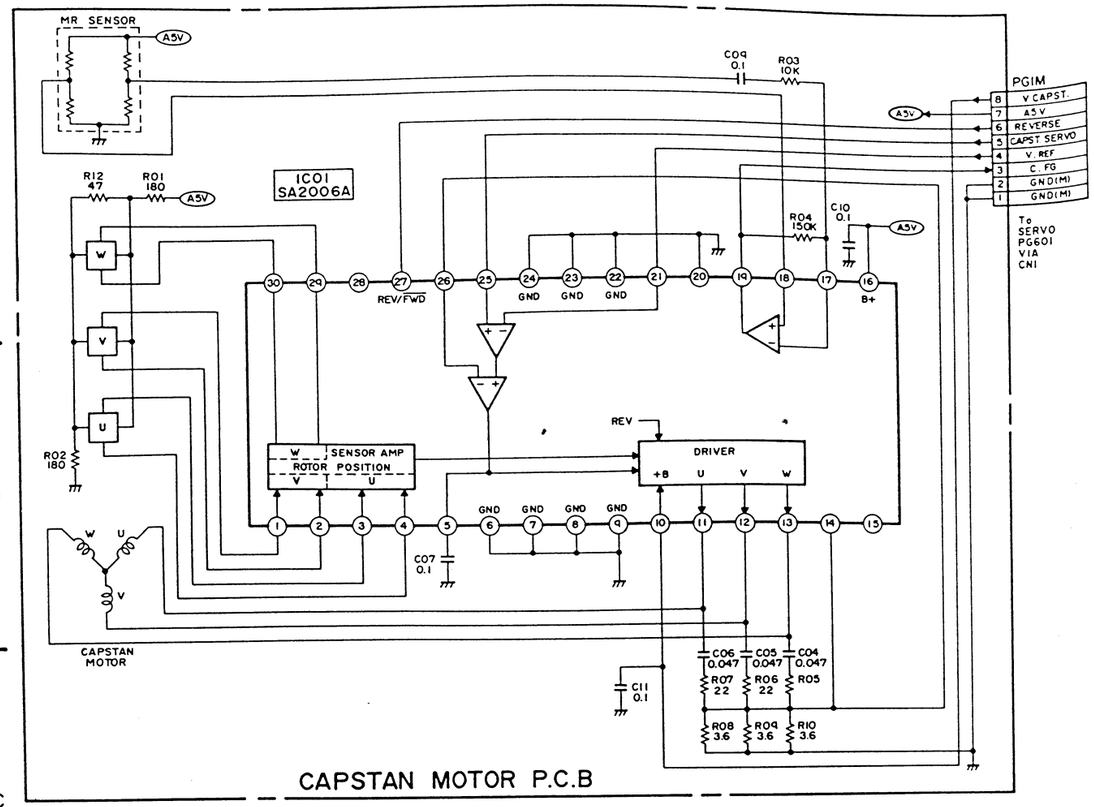


1 IC201-1 0.1V/20μs 430mVp-p REC	13 IC201-19 0.2V/20μs 1.1Vp-p REC
2 IC201-4 0.1V/20μs 480mVp-p PLAY	14 IC201-19 0.5V/20μs 1.2Vp-p PLAY
3 IC201-5 0.1V/20μs 480mVp-p PLAY	15 IC201-20 0.5V/20μs 1.9Vp-p REC/PLAY
4 IC201-7 0.2V/20μs 500mVp-p PLAY	16 IC201-26 0.2V/20μs 580mVp-p REC
5 IC201-8 0.1V/20μs 480mVp-p PLAY	17 IC201-26 0.2/20μs 680mVp-p PLAY
6 IC201-9 0.2V/5ms 530mVp-p PLAY	18 IC202-1 0.1V/200ns 300mp-p REC/PLAY
7 IC201-10 1V/20μs 4.8Vp-p REC/PLAY	19 IC202-4 0.1/10μs 450mVp-p REC/PLAY
8 IC201-12 0.2V/20μs 1Vp-p REC	20 IC203-4 0.5V/20μs 1.6Vp-p PLAY
9 IC201-13 0.1V/20μs 480mVp-p PLAY	21 IC203-6 0.1V/20μs 470mVp-p PLAY
10 IC201-14 50mV/20μs 230mVp-p PLAY	22 IC203-7 0.2V/100ns 1.2Vp-p REC/PLAY
11 IC201-15 50mV/20μs 230mVp p PLAY	23 IC204-1 2V/20μs 5.3Vp-p REC/PLAY
12 IC201-17 50mV/20μs 260mVp p PLAY	24 IC204-2 0.1V/20μs 500mVp-p PLAY
	25 IC204-4 0.1V/20μs 300mVp-p PLAY

1 2 3 4 5 6 7 8

E D C B A

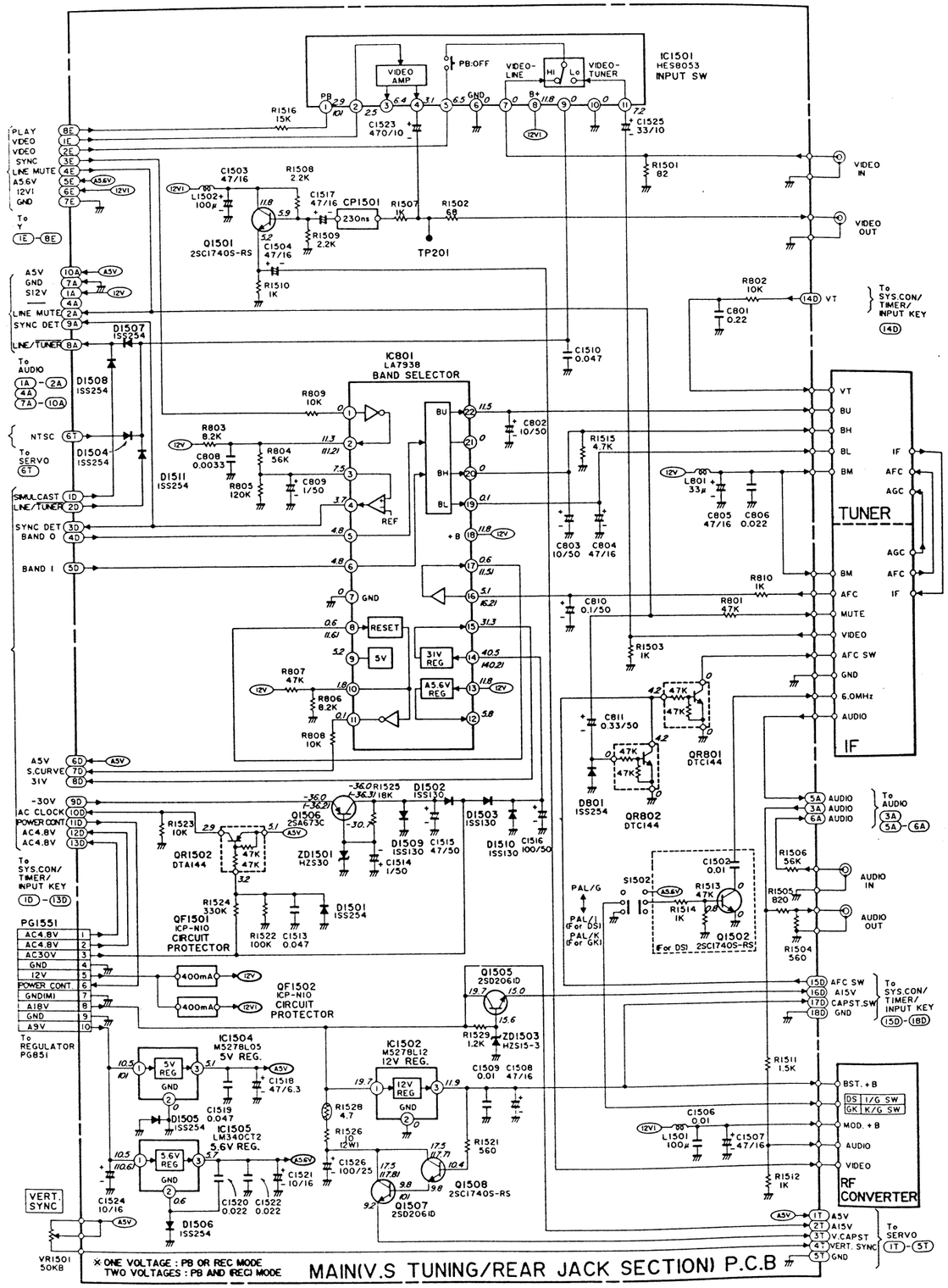
CAPSTAN MOTOR



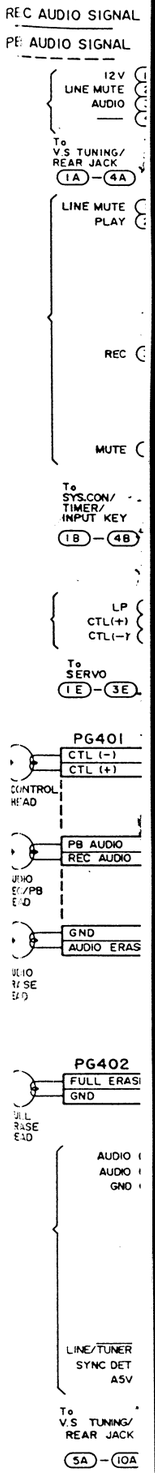
CAPSTAN MOTOR P.C.B

SCHEMATIC DIAGMAM	PAGE
INTERNAL WIRING DAIAGRAM	5-4
RF CONVERTER	5-5
TUNER/IF (For DS)	5-6
TUNER/IF (For GK)	5-8
CHROMA	5-10
PRE/REC AMP	5-11
Y	5-12
CAPSTAN MOTOR	5-14
V. S TUNING/REAR JACK	5-15
AUDIO	5-16
SERVO SUB	5-17
SERVO	5-18
SYS.CON/TIMER/INPUT KEY	5-20
SENSOR	5-22
REGULATOR	5-26

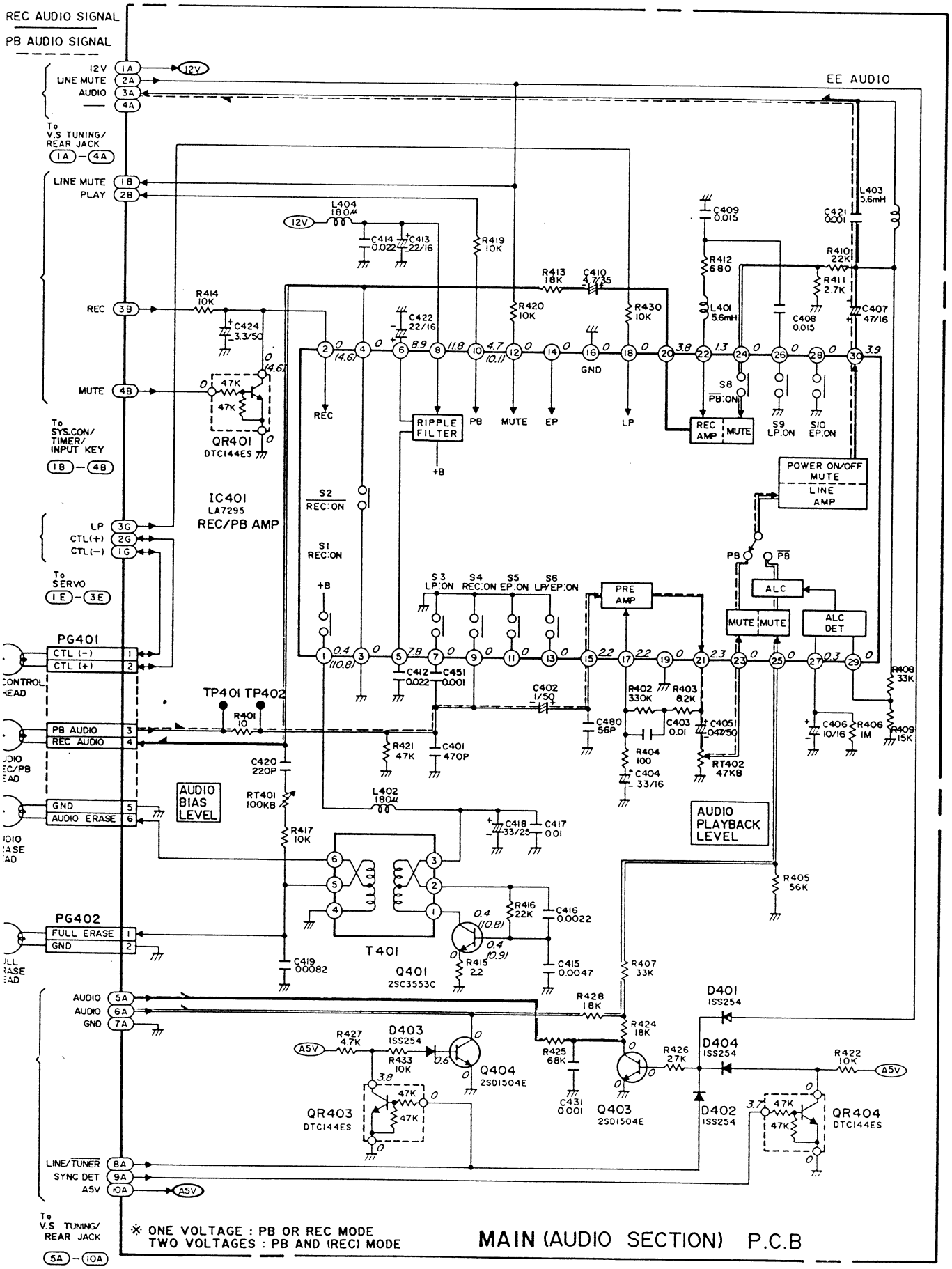
V_S TUNING/REAR JACK



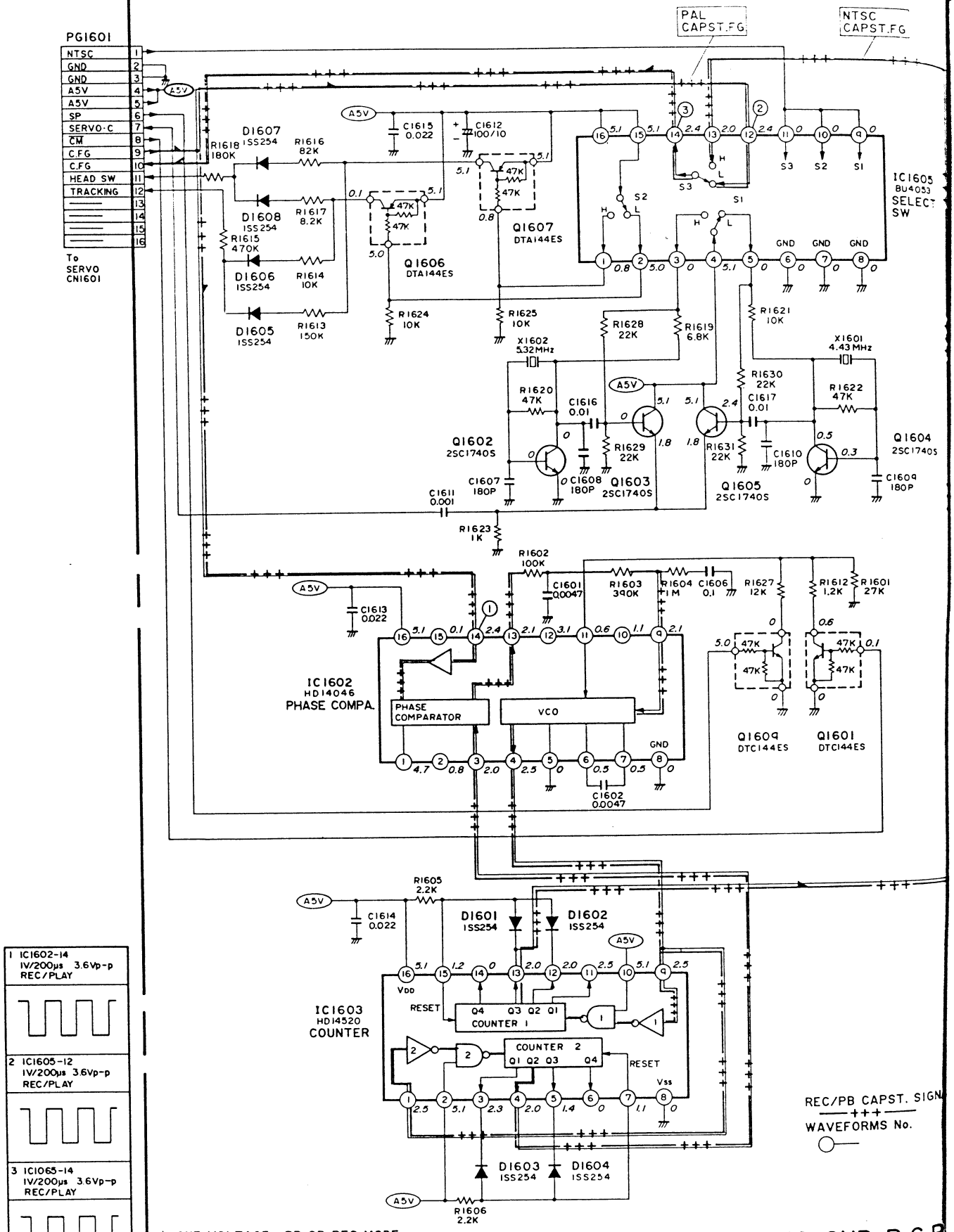
MAIN(V.S TUNING/REAR JACK SECTION) P.C.B



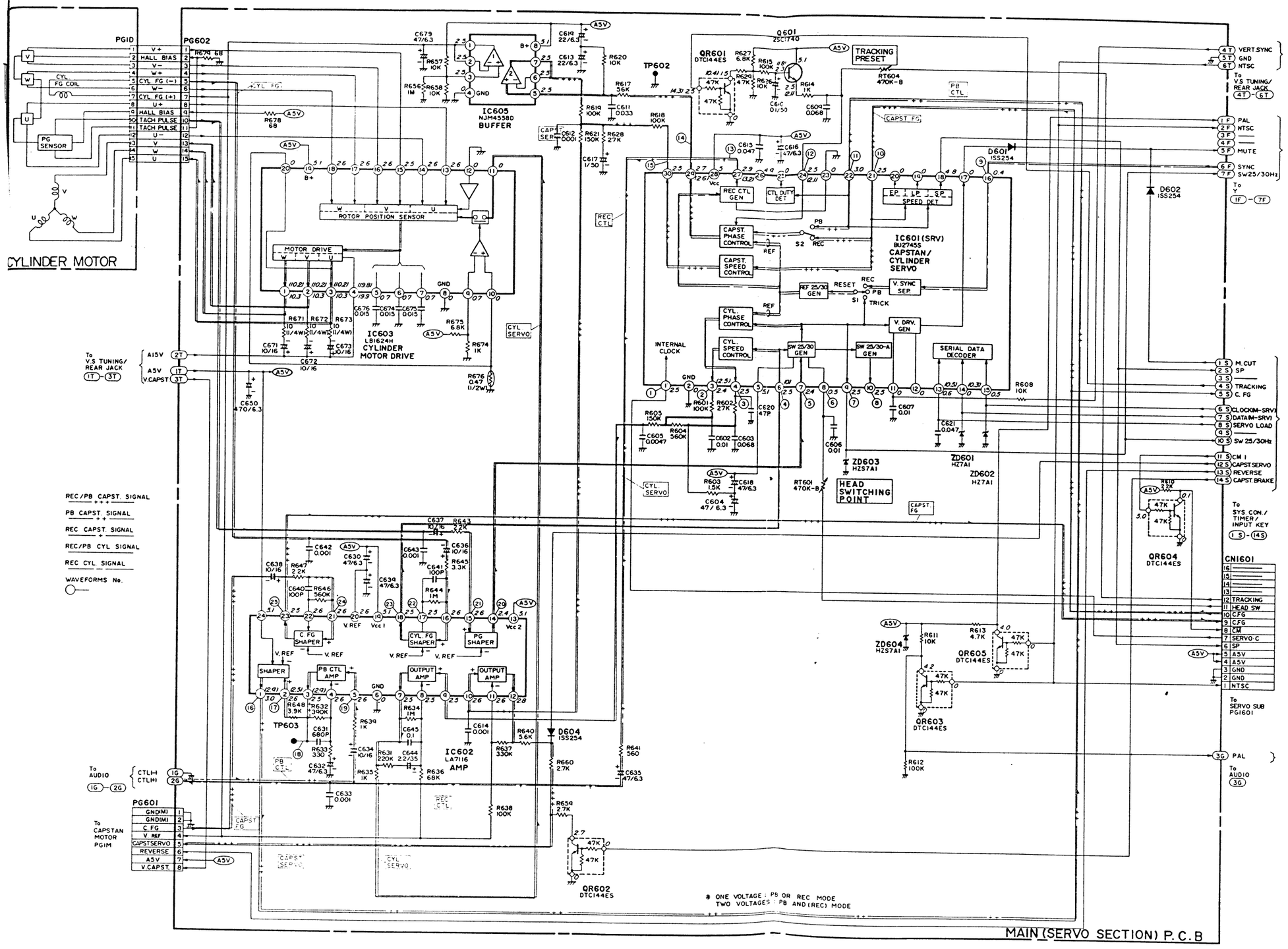
AUDIO


REC AUDIO SIGNAL
PB AUDIO SIGNAL
EE AUDIO
12V
LINE MUTE
AUDIO
To V.S TUNING/ REAR JACK
LINE MUTE
PLAY
REC
MUTE
To SYS.CON/ TIMER/ INPUT KEY
LP
CTL(+)
CTL(-)
To SERVO
PG401
CONTROL HEAD
PB AUDIO
REC AUDIO
GND
AUDIO ERASE
PG402
FULL ERASE
GND
AUDIO
AUDIO
GND
LINE/TUNER
SYNC DET
A5V
To V.S TUNING/ REAR JACK
IC401
LA7295
REC/PB AMP
QR401
DTC144ES
RIPPLE FILTER
REC AMP
MUTE
POWER ON/OFF MUTE
LINE AMP
PRE AMP
ALC
ALC DET
S1 REC:ON
S2 REC:ON
S3 LP:ON
S4 REC:ON
S5 EP:ON
S6 LP/EP:ON
S8 PB:ON
S9 LP:ON
S10 EP:ON
TP401 TP402
AUDIO BIAS LEVEL
AUDIO PLAYBACK LEVEL
T401
Q401 2SC3553C
Q403 2SD1504E
Q404 2SD1504E
QR403 DTC144ES
QR404 DTC144ES
D401 ISS254
D402 ISS254
D403 ISS254
D404 ISS254
L401 5.6mH
L402 180μ
L403 5.6mH
L404 180μ
R401 10
R402 330K
R403 6.2K
R404 100
R405 56K
R406 1M
R407 33K
R408 33K
R409 15K
R410 22K
R411 2.7K
R412 680
R413 18K
R414 10K
R415 2.2
R416 22K
R417 10K
R419 10K
R420 10K
R421 47K
R422 10K
R424 18K
R425 68K
R426 27K
R427 4.7K
R428 18K
R430 10K
R433 10K
RT401 100KB
RT402 47KB
C401 470P
C402 1/50
C403 0.01
C404 33/16
C405 0.47/50
C406 10/16
C407 47/16
C408 0.015
C409 0.015
C410 4.7/35
C412 0.022
C413 22/16
C414 0.022
C415 0.0047
C416 0.0022
C417 0.01
C418 33/25
C419 0.0082
C420 220P
C421 0.001
C422 22/16
C431 0.001
C451 0.001
C480 56P
GND
+B
※ ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE
MAIN (AUDIO SECTION) P.C.B

SERVO SUB

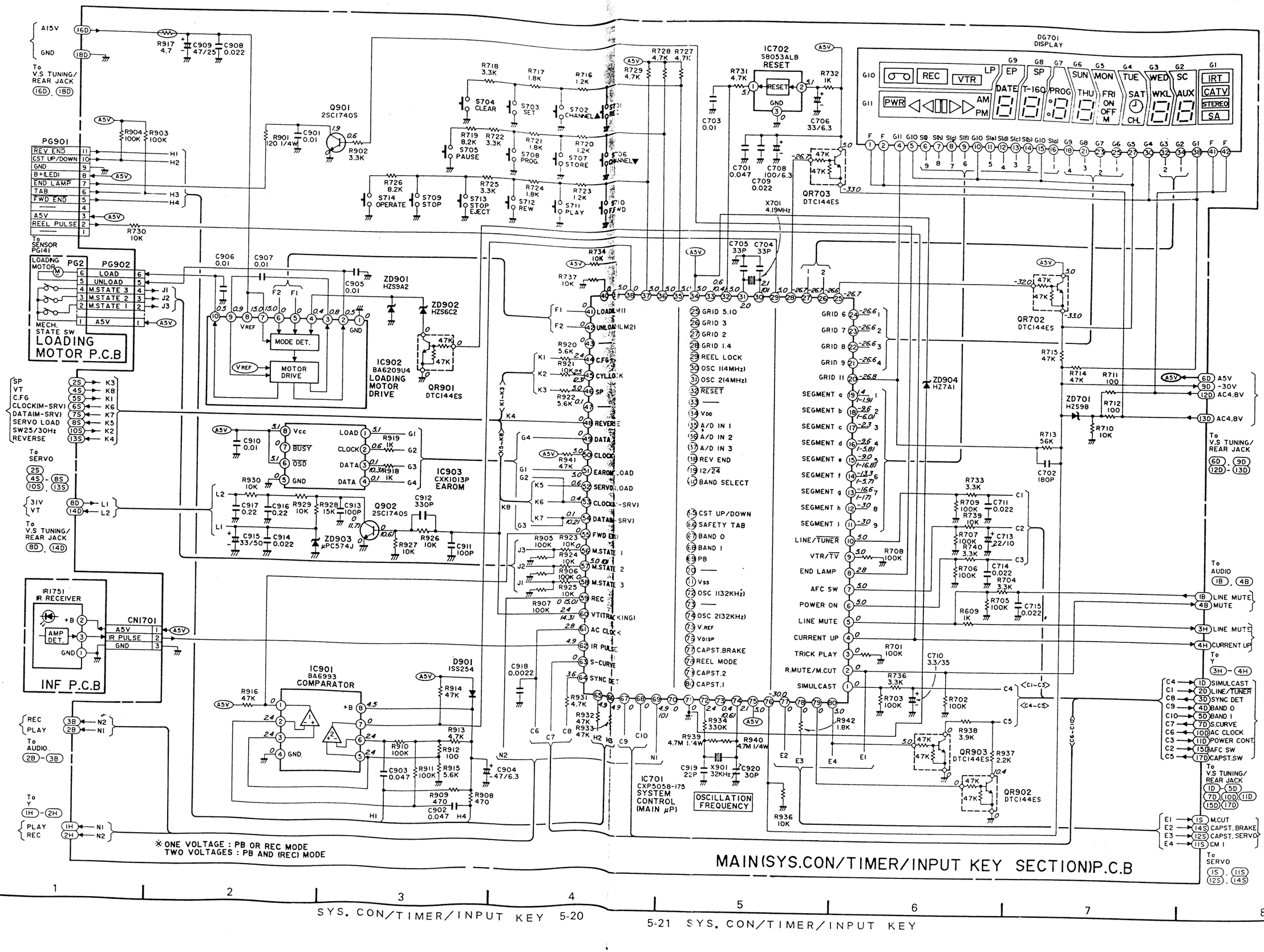

PAL CAPST.FG
NTSC CAPST.FG
PG1601
NTSC
GND
GND
A5V
A5V
SP
SERVO·C
CW
C.FG
C.FG
HEAD SW
TRACKING
To SERVO CN1601
D1607 1SS254
D1608 1SS254
D1606 1SS254
D1605 1SS254
R1618 180K
R1616 82K
R1617 8.2K
R1615 470K
R1614 10K
R1613 150K
R1624 10K
R1625 10K
C1615 0.022
C1612 100/10
Q1607 DTA144ES
Q1606 DTA144ES
IC1605 BU4053 SELECT SW
S1
S2
S3
R1621 10K
R1628 22K
R1619 6.8K
X1602 5.32MHz
X1601 4.43MHz
R1620 47K
R1630 22K
R1622 47K
C1616 0.01
C1617 0.01
Q1602 2SC1740S
Q1603 2SC1740S
Q1605 2SC1740S
Q1604 2SC1740S
R1629 22K
R1631 22K
C1610 180P
C1607 180P
C1608 180P
C1609 180P
C1611 0.001
R1623 1K
R1602 100K
C1601 0.0047
R1603 390K
R1604 1M
C1606 0.1
R1627 12K
R1612 1.2K
R1601 27K
C1613 0.022
IC1602 HD14046 PHASE COMPA.
PHASE COMPARATOR
VCO
C1602 0.0047
Q1609 DTC144ES
Q1601 DTC144ES
R1605 2.2K
C1614 0.022
D1601 1SS254
D1602 1SS254
IC1603 HD14520 COUNTER
COUNTER 1
COUNTER 2
RESET
D1603 1SS254
D1604 1SS254
R1606 2.2K
1 IC1602-14 1V/200µs 3.6Vp-p REC/PLAY
2 IC1605-12 1V/200µs 3.6Vp-p REC/PLAY
3 IC1065-14 1V/200µs 3.6Vp-p REC/PLAY
REC/PB CAPST. SIGN
WAVEFORMS No.
* ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE
SERVO SUB P.C.B

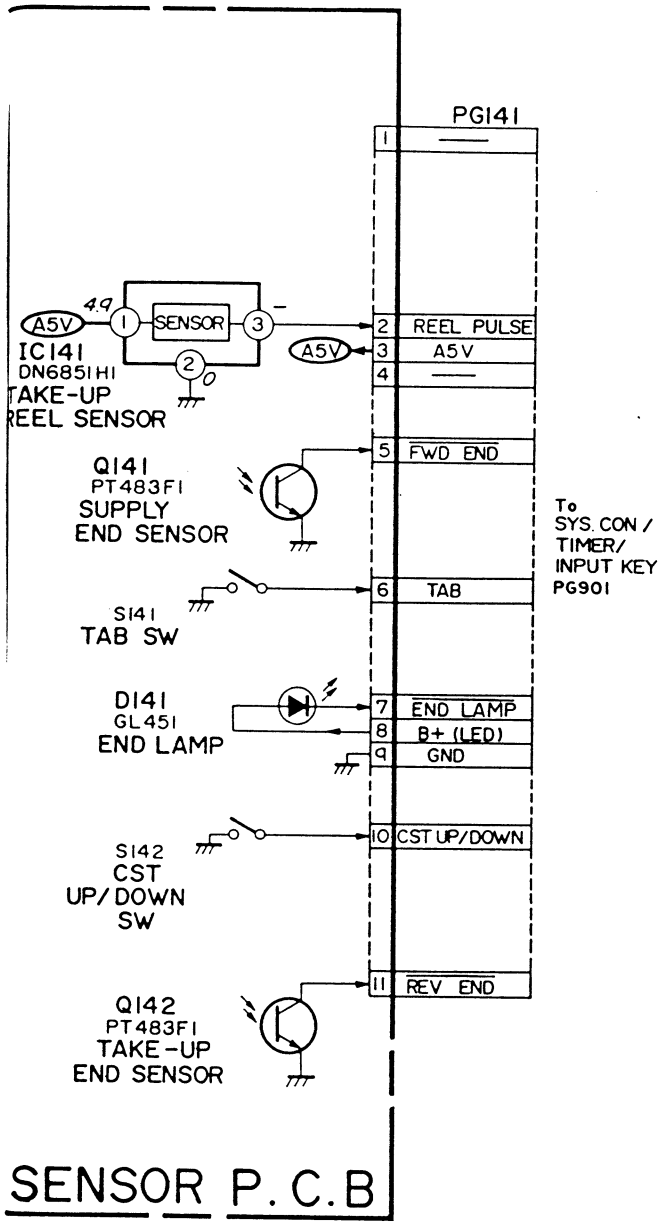
SERVO

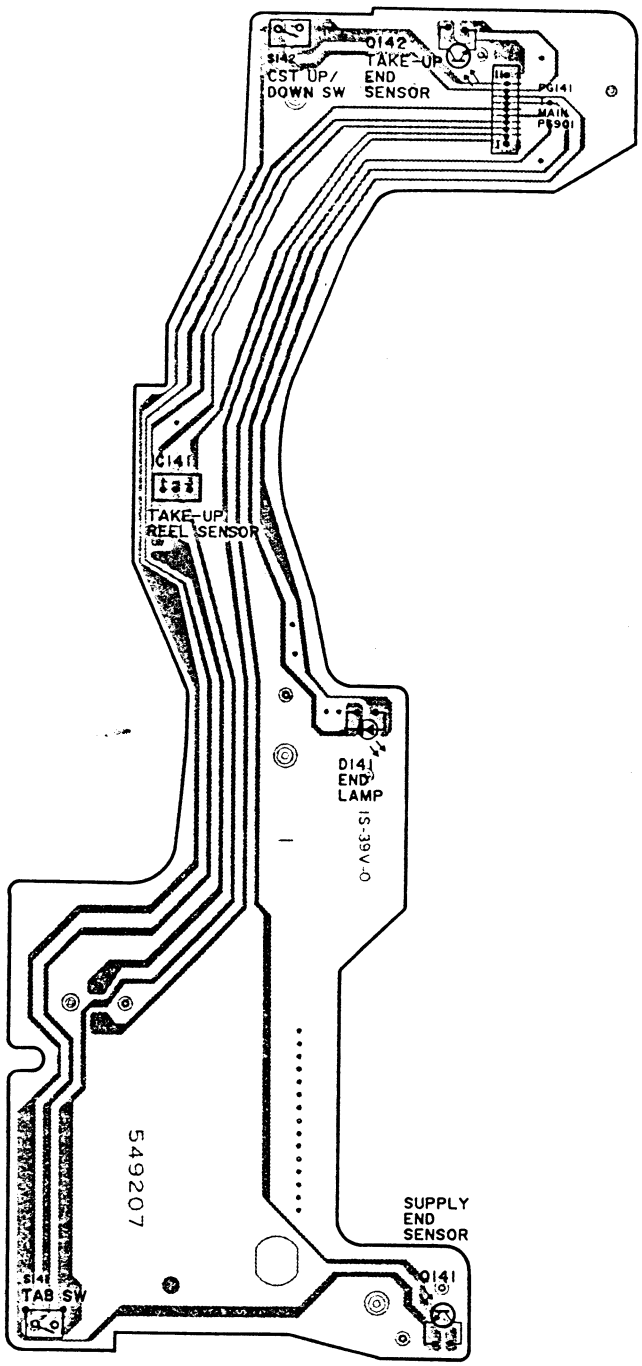


1 IC601-1 0.2V/200ns 1.2Vp-p REC/PLAY	13 IC601-27 1V/10ms 5Vp-p REC
2 IC601-3 2V/500ns 6.9Vp-p REC/PLAY	14 IC601-29 2V/500ns 7Vp-p REC/PLAY
3 IC601-4 2V/500ns 6.2Vp-p REC/PLAY	15 IC601-30 2V/500ns 7Vp-p REC/PLAY
4 IC601-6 1V/1ms 3.6Vp-p REC/PLAY	16 IC602-1 1V/10ms 3.7p-p REC/PLAY
5 IC601-7 1V/10ms 3.6Vp-p REC/PLAY	17 IC602-2 1V/10ms 3.7Vp-p REC/PLAY
6 IC601-8 0.5V/5ms 2.5Vp-p REC/PLAY	18 IC602-3 1V/10ms 3.7Vp-p REC/PLAY
7 IC601-9 1V/5ms 5.1Vp-p REC/PLAY	19 IC602-5 1V/10ms 3Vp-p REC/PLAY
8 IC601-10 1V/5ms 5.1Vp-p REC/RLAY	20 IC602-14 1V/10ms 3.7Vp-p REC/PLAY
9 IC601-16 1V/20µs 4.8Vp-p REC/PLAY	21 IC602-15 50mV/10ms 140mVp-p REC/PLAY
10 IC601-21 1V/200µs 3.5Vp-p REC/PLAY	22 IC602-17 1V/2ms 3.7Vp-p REC/PLAY
11 IC601-22 1V/10ms 3.8Vp-p REC/PLAY	23 IC602-18 1V/2ms 3.7Vp-p REC/PLAY
12 IC601-24 1V/10ms 2.7Vp-p REC/PLAY	24 IC602-21 0.1V/500µs 430mVp-p REC/PLAY
	25 IC602-23 1V/200µs 3.7Vp-p REC/PLAY

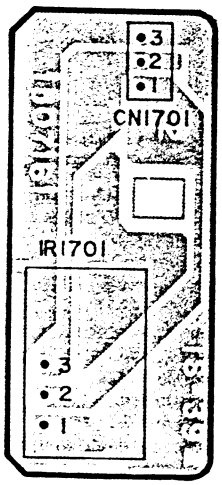
SYS_CON/TIMER/INPUT KEY







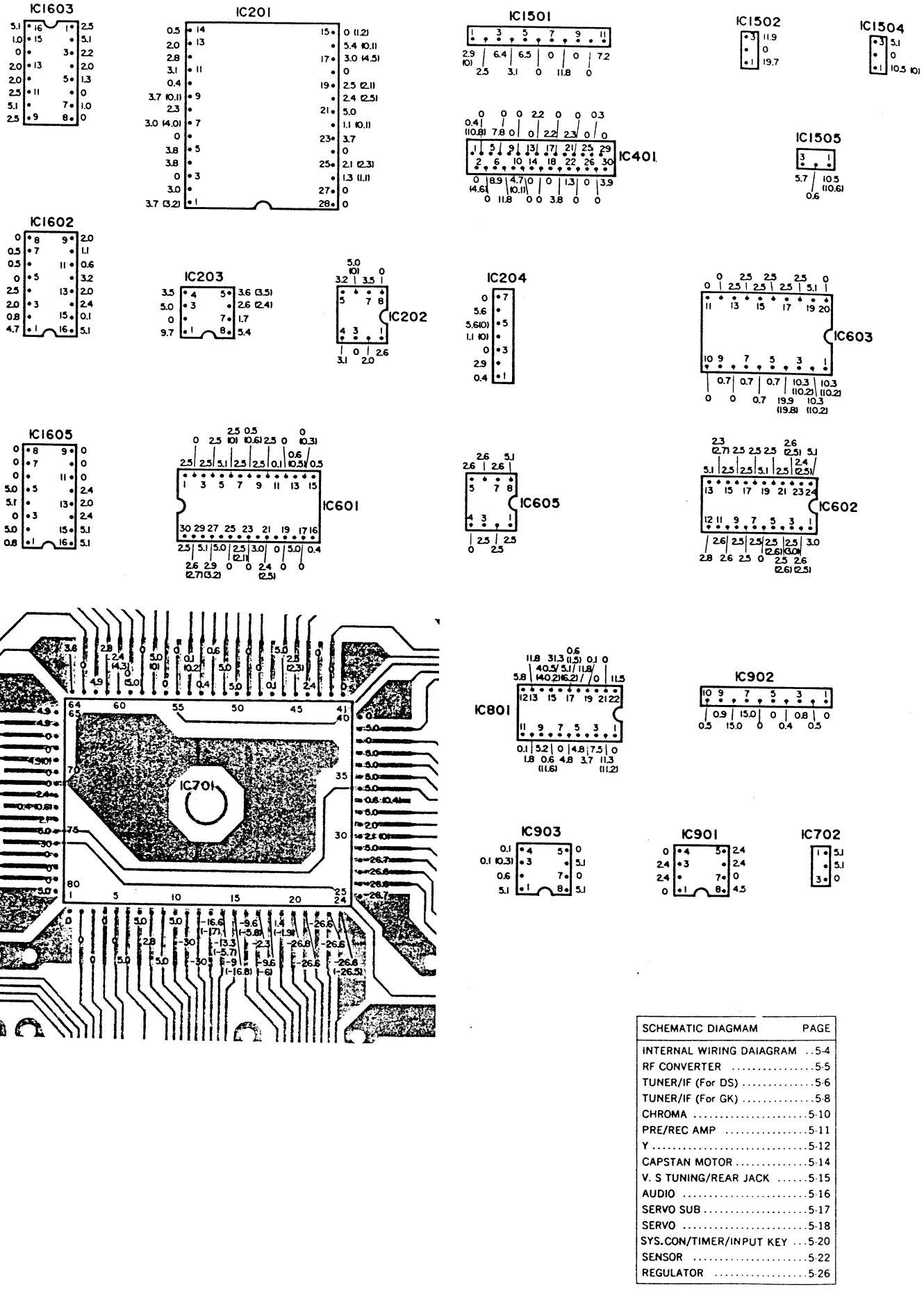
SENSOR P.C.B



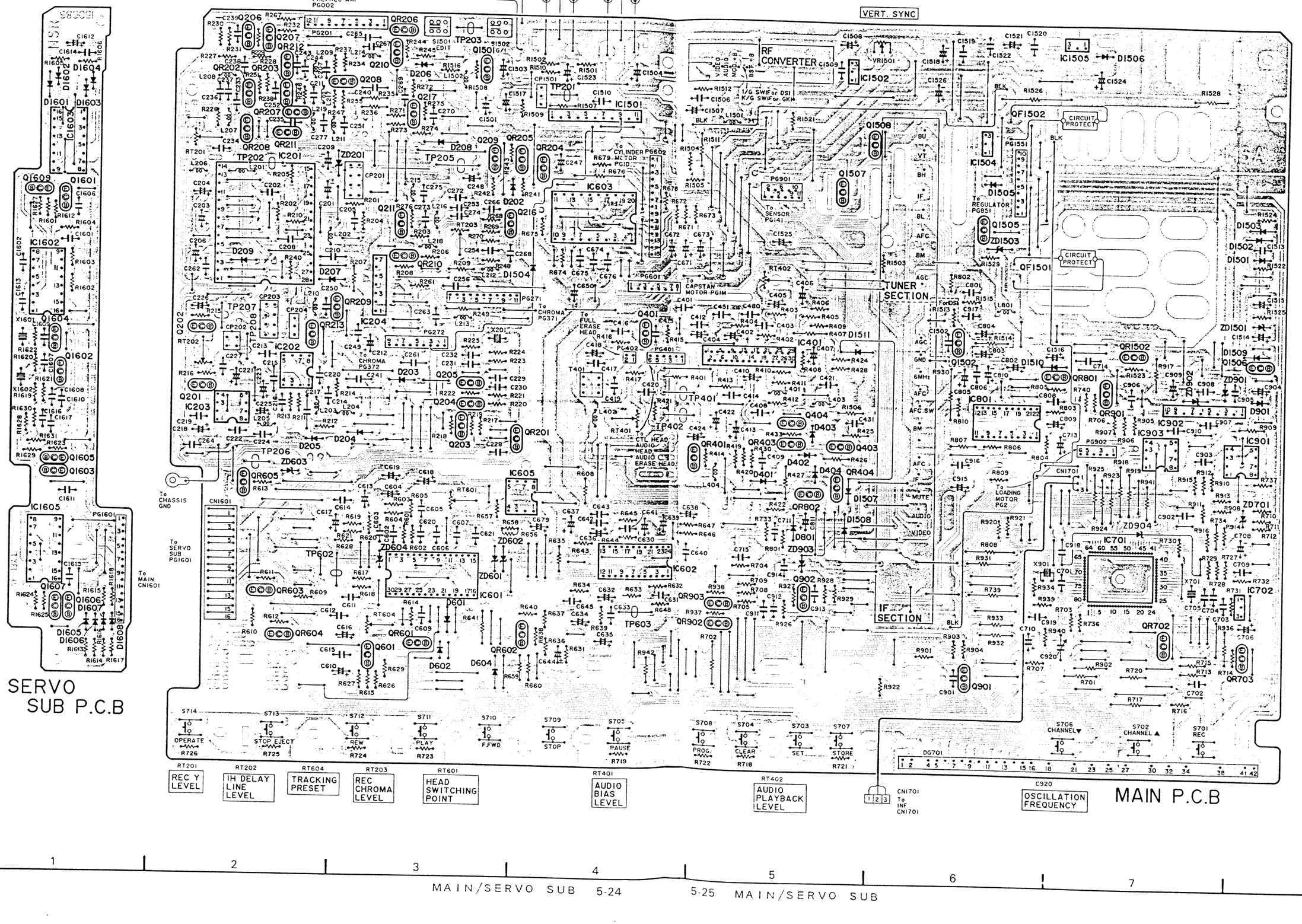
INF P.C.B

SCHEMATIC DIAGMAM	PAGE
INTERNAL WIRING DAIAGRAM	5-4
RF CONVERTER	5-5
TUNER/IF (For DS)	5-6
TUNER/IF (For GK)	5-8
CHROMA	5-10
PRE/REC AMP	5-11
Y	5-12
CAPSTAN MOTOR	5-14
V. S TUNING/REAR JACK	5-15
AUDIO	5-16
SERVO SUB	5-17
SERVO	5-18
SYS.CON/TIMER/INPUT KEY	5-20
SENSOR	5-22
REGULATOR	5-26

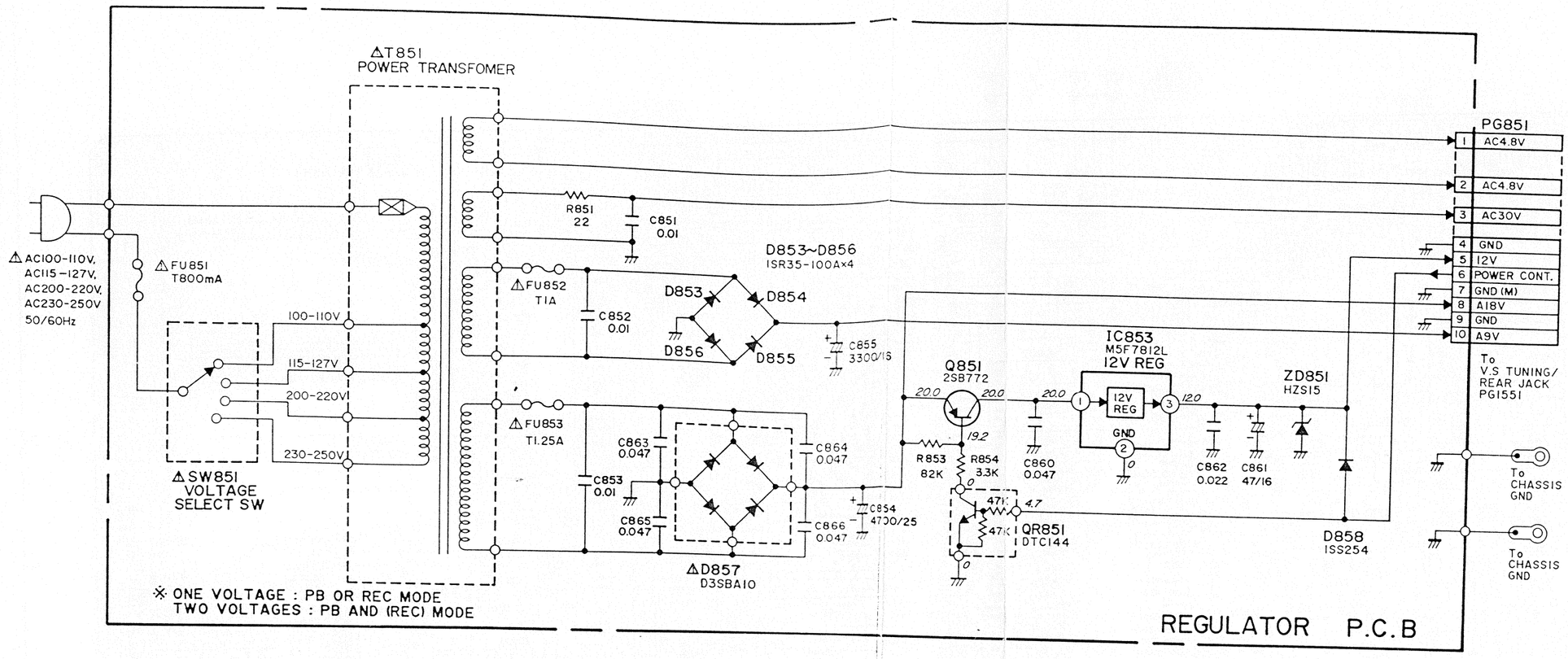
MAIN(VOLTAGE)

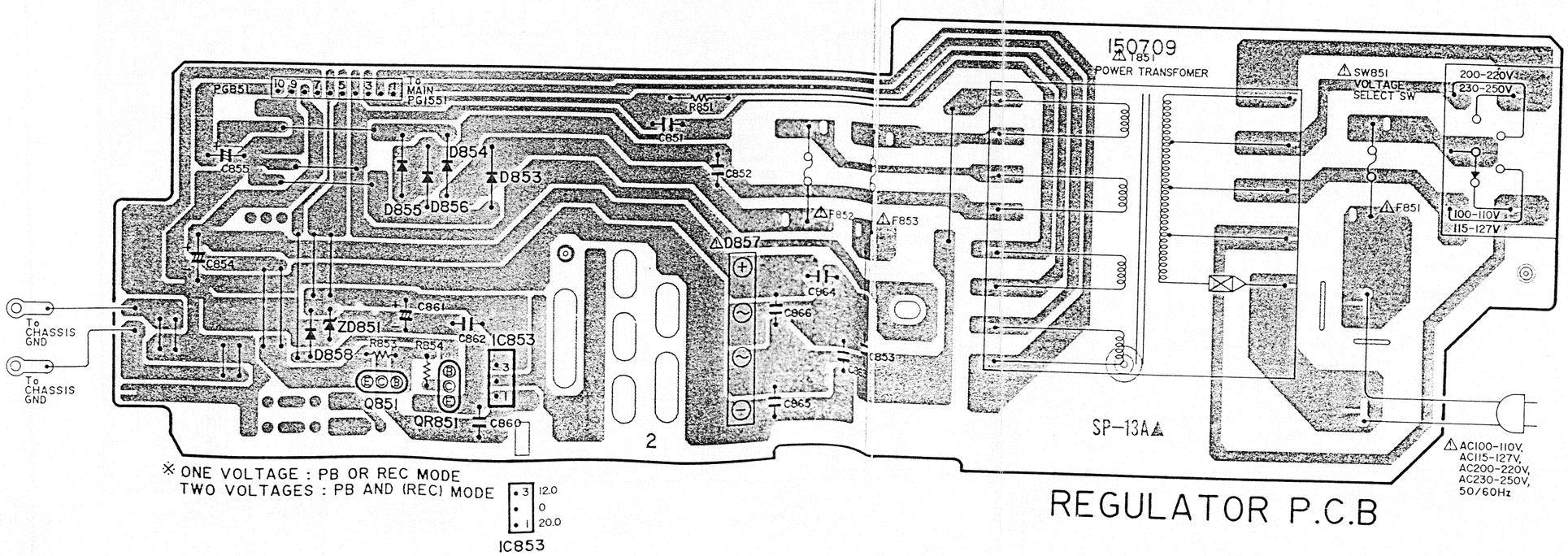


SCHEMATIC DIAGMAM	PAGE
INTERNAL WIRING DAIAGRAM	5-4
RF CONVERTER	5-5
TUNER/IF (For DS)	5-6
TUNER/IF (For GK)	5-8
CHROMA	5-10
PRE/REC AMP	5-11
Y	5-12
CAPSTAN MOTOR	5-14
V. S TUNING/REAR JACK	5-15
AUDIO	5-16
SERVO SUB	5-17
SERVO	5-18
SYS.CON/TIMER/INPUT KEY	5-20
SENSOR	5-22
REGULATOR	5-26


SERVO SUB P.C.B
MAIN P.C.B
QF201
CIRCUIT PROTECT
VIDEO OUT
VIDEO IN
AUDIO OUT
AUDIO IN
To PRE/REC AMP PG002
VERT. SYNC
RF CONVERTER
TUNER SECTION
IF SECTION
To CYLINDER MOTOR PG602
To CAPSTAN MOTOR PG1M
To SENSOR PG141
To REGULATOR PG851
To LOADING MOTOR PG2
To CHASSIS GND
To SERVO SUB PG1601
To MAIN CN1601
To FULL ERASE HEAD
To CTL HEAD AUDIO HEAD AUDIO ERASE HEAD
To CHROMA PG371
To CHROMA PG372
CN1601
CN1701 To INF CN1701
DG701
OPERATE R726
STOP EJECT R725
REW R724
PLAY R723
F.FWD
STOP
PAUSE R719
PROG. R722
CLEAR R718
SET
STORE R721
CHANNEL▼
CHANNEL▲
REC
RT201 REC Y LEVEL
RT202 1H DELAY LINE LEVEL
RT604 TRACKING PRESET
RT203 REC CHROMA LEVEL
RT601 HEAD SWITCHING POINT
RT401 AUDIO BIAS LEVEL
RT402 AUDIO PLAYBACK LEVEL
C920 OSCILLATION FREQUENCY
MAIN/SERVO SUB 5-24
5-25 MAIN/SERVO SUB

REGULATOR





SCHEMATIC DIAGMAM	PAGE
INTERNAL WIRING DAIAGRAM	5-4
RF CONVERTER	5-5
TUNER/IF (For DS)	5-6
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Y	5-12
CAPSTAN MOTOR	5-14
V. S TUNING/REAR JACK	5-15
AUDIO	5-16
SERVO SUB	5-17
SERVO	5-18
SYS.CON/TIMER/INPUT KEY	5-20
SENSOR	5-22
REGULATOR	5-26

REPLACEMENT PARTS LIST
ELECTRICAL PARTS LIST

SYMBOL-NO	P-NO	DESCRIPTION
		CAPACITORS
C 202	0890022	CERAMIC DISC 100PF+−50% 50V
C 205	0890026	CERAMIC DISC 220PF+−10% 50V
C 207	0890014	CERAMIC DISC 27PF+−50% 50V
C 208	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 209	0256790	ELECTROLYTIC 220UF 6.3V
C 210	0890031	CERAMIC DISC 470PF+−10% 50V
C 211	0890021	CERAMIC DISC 82PF+−10% 50V
C 213	0890035	CERAMIC DISC 1000PF 50V
C 214	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 215	0890011	CERAMIC DISC 15PF+−5% 50V
C 216	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 217	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 219	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 220	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 222	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 224	0890014	CERAMIC DISC 27PF+−50% 50V
C 227	0890018	CERAMIC DISC 56PF+−50% 50V
C 228	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 229	0890028	CERAMIC DISC 330PF+−10% 50V
C 230	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 231	0890026	CERAMIC DISC 220PF+−10% 50V
C 232	0890006	CERAMIC DISC 6.8PF+−10% 50V
C 233	0890005	CERAMIC DISC 4.7PF 50V
C 234	0890013	CERAMIC DISC 22PF+−5% 50V
C 235	0890016	CERAMIC DISC 39PF+−50% 50V
C 236	0890015	CERAMIC DISC 33PF+−50% 50V
C 237	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 238	0890028	CERAMIC DISC 330PF+−10% 50V
C 239	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 240	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 241	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 243	0890015	CERAMIC DISC 33PF+−50% 50V
C 244	0890007	CERAMIC DISC 8.2PF+−10% 50V
C 250	0890015	CERAMIC DISC 33PF+−50% 50V
C 251	0890016	CERAMIC DISC 39PF+−50% 50V
C 252	0890015	CERAMIC DISC 33PF+−50% 50V
C 253	0890017	CERAMIC DISC 47PF+−5% 50V
C 254	0890018	CERAMIC DISC 56PF+−50% 50V
C 256	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 261	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 262	0890023	CERAMIC DISC 120PF+−10% 50V
C 263	0890011	CERAMIC DISC 15PF+−5% 50V
C 264	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 265	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 266	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 267	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 268	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 269	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 270	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 272	0890018	CERAMIC DISC 56PF+−50% 50V
C 273	0208692	CERAMIC DISC 220PF+−5% 50V
C 274	0208692	CERAMIC DISC 220PF+−5% 50V
C 275	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 277	0890014	CERAMIC DISC 27PF+−50% 50V
C 302	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 303	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 306	0890015	CERAMIC DISC 33PF+−50% 50V
C 308	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 309	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 310	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 311	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 312	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 313	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 317	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 319	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 351	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 352	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 353	0890019	CERAMIC DISC 68PF+−50% 50V
C 357	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 358	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 401	0208524	CERAMIC DISC 470PF+−5% 50V
C 402	0256606	ELECTROLYTIC 1UF 50V
C 410	0256613	ELECTROLYTIC 4.7UF 35V
C 412	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 414	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 417	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 420	0890026	CERAMIC DISC 220PF+−10% 50V
C 480	0890018	CERAMIC DISC 56PF+−50% 50V
C 620	0890017	CERAMIC DISC 47PF+−5% 50V
C 631	0890033	CERAMIC DISC 680PF+−10% 50V
C 633	0890035	CERAMIC DISC 1000PF 50V
C 640	0890022	CERAMIC DISC 100PF+−10% 50V
C 641	0890022	CERAMIC DISC 100PF+−10% 50V
C 642	0890035	CERAMIC DISC 1000PF 50V
C 643	0890035	CERAMIC DISC 1000PF 50V
C 702	0890025	CERAMIC DISC 180PF+−10% 50V
C 703	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 704	0890015	CERAMIC DISC 33PF+−50% 50V
C 705	0890015	CERAMIC DISC 33PF+−50% 50V
C 709	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 711	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 714	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 715	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 802	0256616	ELECTROLYTIC 10UF 50V
C 804	0256627	ELECTROLYTIC 47UF 16V
C 806	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 854	0256787	ELECTROLYTIC 4700UF 25V
C 855	0256864	ELECTROLYTIC 3300UF 16V
C 901	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 905	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 906	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 907	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 908	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 910	0890043	CERAMIC DISC 0.01UF+−20% 16V
C 911	0208464	CERAMIC DISC 100PF+−5% 50V
C 912	0890078	CERAMIC DISC 330PF+−10% 50V
C 913	0890022	CERAMIC DISC 100PF+−10% 50V
C 914	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C 918	0890037	CERAMIC DISC 2200PF+−20% 16V
C 919	0208448	CERAMIC DISC 22PF+−5% 50V
C 920	5058493	TRIMMER 30PF
C1506	0890043	CERAMIC DISC 0.01UF+−20% 16V
C1509	0890043	CERAMIC DISC 0.01UF+−20% 16V
C1520	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C1522	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C1607	0890025	CERAMIC DISC 180PF+−10% 50V
C1608	0890025	CERAMIC DISC 180PF+−10% 50V
C1609	0890025	CERAMIC DISC 180PF+−10% 50V

SYMBOL-NO	P-NO	DESCRIPTION
C1610	0890025	CERAMIC DISC 180PF+−10% 50V
C1611	0890035	CERAMIC DISC 1000PF 50V
C1613	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C1614	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C1615	0890044	CERAMIC DISC 0.022UF+80−20% 25V
C1616	0890043	CERAMIC DISC 0.01UF+−20% 16V
C1617	0890043	CERAMIC DISC 0.01UF+−20% 16V
		RESISTORS
R 657	0171276	METAL FILM 10KOHM+−1% 1/8W
R 658	0171276	METAL FILM 10KOHM+−1% 1/8W
R 676	0149705	METAL OXIDE 0.47OHM+−5% 1/2W
R 851	0170481	FUSE RESISTOR 22OHM+−5% 1/4W
R 971	0249683	POSISTOR RTH−CH4R7F
RT 201	5030004	SEMI VARIABLE 1KOHM
RT 202	5030004	SEMI VARIABLE 1KOHM
RT 203	5030004	SEMI VARIABLE 1KOHM
RT 351	5030003	SEMI VARIABLE 470OHM
RT 401	5030011	SEMI VARIABLE 100KOHM
RT 402	5030009	SEMI VARIABLE 47KOHM
RT 601	5030013	SEMI VARIABLE 470KOHM
RT 604	5030013	SEMI VARIABLE 470KOHM
R1526	0171047	METAL OXIDE 10OHM+−5% 2W
R1528	0249683	POSISTOR RTH−CH4R7F
VR1501	5009143	VARIABLE 50KOHM
		SEMI-CONDUCTORS
D 141	5380933	LED GL−451
D 202	5339131	DIODE 1SS254
D 203	5339131	DIODE 1SS254
D 204	5339131	DIODE 1SS254
D 205	5339131	DIODE 1SS254
D 206	5339131	DIODE 1SS254
D 207	5339131	DIODE 1SS254
D 208	5339131	DIODE 1SS254
D 209	5339131	DIODE 1SS254
D 301	5339131	DIODE 1SS254
D 302	5339131	DIODE 1SS254
D 401	5339131	DIODE 1SS254
D 402	5339131	DIODE 1SS254
D 403	5339131	DIODE 1SS254
D 404	5339131	DIODE 1SS254
D 601	5339131	DIODE 1SS254
D 602	5339131	DIODE 1SS254
D 604	5339131	DIODE 1SS254
D 801	5339131	DIODE 1SS254
D 853	5339231	DIODE 1SR35−100A
D 854	5339231	DIODE 1SR35−100A
D 855	5339231	DIODE 1SR35−100A
D 856	5339231	DIODE 1SR35−100A
⚠ D 857	5333351	DIODE D3SBA10
D 858	5339131	DIODE 1SS254
D 901	5339131	DIODE 1SS254
D1501	5339131	DIODE 1SS254
D1502	5339171	DIODE 1SS130
D1503	5339171	DIODE 1SS130
D1504	5332781	DIODE 1SS254
D1506	5339131	DIODE 1SS254
D1507	5339131	DIODE 1SS254
D1508	5339131	DIODE 1SS254
D1509	5339171	DIODE 1SS130
D1510	5339171	DIODE 1SS130
D1511	5339131	DIODE 1SS254
D1601	5339131	DIODE 1SS254
D1602	5339131	DIODE 1SS254

SYMBOL-NO	P-NO	DESCRIPTION
D1603	5339131	DIODE 1SS254
D1604	5339131	DIODE 1SS254
D1605	5339131	DIODE 1SS254
D1606	5339131	DIODE 1SS254
D1607	5339131	DIODE 1SS254
D1608	5339131	DIODE 1SS254
IC 141	5391282	IC DN6851
IC 201	1370464	IC HT4947C
IC 202	1341701	IC NJM2228D
IC 203	5362263	IC MSM6965RS
IC 204	1380643	IC HES8081B
IC 301	1380572	IC SMH-HES8463A
IC 351	5366641	IC BA7025L
IC 401	1341471	IC LA7295
IC 601	1342161	IC BU2745S
IC 602	1341421	IC LA7116
IC 603	1341941	IC LB1624H
IC 605	5350601	IC NJM4558D
IC 701	5306561	IC CXP−5058−175Q
IC 702	5361943	IC S−8054ALB
IC 801	1341331	IC LA7938
IC 853	1341514	IC M5F7812
IC 901	5367221	IC BA6993
IC 902	5300794	IC BA6209U4
IC 903	5301422	IC CXK1013P
IC1501	1387981	MODULE HES8053
IC1502	5364604	IC M5278L12
IC1504	1341513	IC M5F7805L
IC1505	1342092	IC LM340CT0.2
IC1602	1343481	IC HD14046BP
IC1603	1343491	IC HD14520BP
IC1605	5362041	IC BU4053B
Q 141	5324661	TRANSISTOR PT−483F1
Q 142	5324661	TRANSISTOR PT−483F1
Q 201	5327061	TRANSISTOR 2SC1740S−ST
Q 202	5327021	TRANSISTOR 2SA844CD−TB
Q 203	5327061	TRANSISTOR 2SC1740S−ST
Q 204	5327061	TRANSISTOR 2SC1740S−ST
Q 205	5327061	TRANSISTOR 2SC1740S−ST
Q 206	5327061	TRANSISTOR 2SC1740S−ST
Q 207	5327061	TRANSISTOR 2SC1740S−ST
Q 208	0573511	TRANSISTOR 2SC535C
Q 209	5327151	TRANSISTOR 2SA952−ML2
Q 210	5327151	TRANSISTOR 2SA952−ML2
Q 211	5327061	TRANSISTOR 2SC1740S−ST
Q 216	5327061	TRANSISTOR 2SC1740S−ST
Q 217	5327061	TRANSISTOR 2SC1740S−ST
Q 301	5327061	TRANSISTOR 2SC1740S−ST
Q 302	5327061	TRANSISTOR 2SC1740S−ST
Q 303	5327061	TRANSISTOR 2SC1740S−ST
Q 401	5327101	TRANSISTER 2SC3553BC
Q 403	5327091	TRANSISTER 2SD1504E
Q 404	5327091	TRANSISTER 2SD1504E
Q 601	5327063	TRANSISTOR 2SC1740S
Q 851	5323331	TRANSISTOR 2SB772Q
Q 901	5327063	TRANSISTOR 2SC1740S
Q 902	5327061	TRANSISTOR 2SC1740S−ST
Q1501	5327061	TRANSISTOR 2SC1740S−ST
Q1502	5327063	TRANSISTOR 2SC1740S −For (D$)−
Q1505	5324862	TRANSISTOR 2SD2061D
Q1506	5327031	TRANSISTOR 2SA673C
Q1507	5324861	TRANSISTOR 2SD2061D
Q1508	5327063	TRANSISTOR 2SC1740S
Q1601	5327073	TRANSISTOR DTC144ES
Q1602	5327062	TRANSISTOR 2SC1740SR(2SC1740$ OR R)

SYMBOL-NO	P-NO	DESCRIPTION
Q1603	5327062	TRANSISTOR 2SC1740SR(2SC1740S OR R)
Q1604	5327062	TRANSISTOR 2SC1740SR(2SC1740S OR R)
Q1605	5327062	TRANSISTOR 2SC1740SR(2SC1740S OR R)
Q1606	5327074	TRANSISTOR DTA144ES−T
Q1607	5327074	TRANSISTOR DTA144ES−T
Q1609	5327073	TRANSISTOR DTC144ES
QR 201	5327073	TRANSISTOR DTC144ES
QR 202	5323561	TRANSISTOR DTC124F
QR 203	5323563	TRANSISTOR DTC144F
QR 204	5327073	TRANSISTOR DTC144ES
QR 205	5327073	TRANSISTOR DTC144ES
QR 206	5327073	TRANSISTOR DTC144ES
QR 207	5323563	TRANSISTOR DTC144F
QR 208	5323561	TRANSISTOR DTC124F
QR 209	5327073	TRANSISTOR DTC144ES
QR 210	5323563	TRANSISTOR DTC144ES
QR 211	5327073	TRANSISTOR DTC144ES
QR 212	5323563	TRANSISTOR DTC144F
QR 213	5323563	TRANSISTOR DTC144F
QR 301	5327073	TRANSISTOR DTC144ES
QR 351	5327073	TRANSISTOR DTC144ES
QR 401	5327073	TRANSISTOR DTC144ES
QR 403	5327073	TRANSISTOR DTC144ES
QR 404	5327073	TRANSISTOR DTC144ES
QR 601	5327073	TRANSISTOR DTC144ES
QR 602	5327073	TRANSISTOR DTC144ES
QR 603	5327073	TRANSISTOR DTC144ES
QR 604	5327073	TRANSISTOR DTC144ES
QR 605	5327073	TRANSISTOR DTC144ES
QR 702	5327073	TRANSISTOR DTC144ES
QR 703	5327073	TRANSISTOR DTC144ES
QR 801	5327073	TRANSISTOR DTC144ES
QR 802	5327073	TRANSISTOR DTC144ES
QR 851	5327073	TRANSISTOR DTC144ES
QR 901	5327073	TRANSISTOR DTC144ES
QR 902	5327073	TRANSISTOR DTC144ES
QR 903	5327073	TRANSISTOR DTC144ES
QR1502	5327074	TRANSISTOR DTA144ES−T
ZD 201	5339296	DIODE HZS5B2
ZD 601	5339263	DIODE HZS7−A1
ZD 602	5339263	DIODE HZS7−A1
ZD 603	5339263	DIODE HZS7−A1
ZD 604	5339263	DIODE HZS7−A1
ZD 701	5339265	DIODE HZS9−B3
ZD 704	5339263	HZS7−A1
ZD 851	5339274	DIODE HZS15−3
ZD 901	5339271	DIODE HZS9A2
ZD 902	5339262	DIODE HZS6−C2
ZD 903	5366151	IC UPC574J
ZD1501	5339256	DIODE HZS30
ZD1503	5339274	DIODE HZS15−3

TRANSFORMERS

T 401	5262532	BIAS COIL

COILS

L 201	5159147	CHOKE COIL 33UH
L 202	5159084	CHOKE COIL 330UH
L 203	5159089	CHOKE COIL 820UH+−10%
L 204	5159089	CHOKE COIL 820UH+−10%
L 205	5159141	CHOKE COIL 10UH
L 206	5159075	CHOKE COIL 68UH+−10%
L 207	5121175	COIL 22UH
L 208	5153014	CHOKE COIL 100UH
L 209	5153036	CHOKE COIL 27UH
L 210	5121179	CHOKE COIL 47UH
L 211	5153035	COIL 22UH
L 212	5159082	CHOKE COIL 220UH+−10%
L 213	5121178	CHOKE COIL 39UH
L 214	5159084	CHOKE COIL 330UH
L 215	5152341	CHOKE COIL 180UH
L 216	5152342	CHOKE COIL 220UH+−10%
L 217	5153039	CHOKE COIL 47UH
L 218	5159081	CHOKE COIL 180UH+−10%
L 219	5153039	CHOKE COIL 47UH
L 301	5152337	CHOKE COIL 100UH+−10%
L 302	5152344	CHOKE COIL 330UH
L 303	5121173	COIL 82UH 47UH
L 304	5121183	COIL
L 351	5130431	COIL
L 352	5159077	CHOKE COIL 100UH+−10%
L 401	5159111	CHOKE COIL 5600UH
L 402	5159081	CHOKE COIL 180UH+−10%
L 403	5159111	CHOKE COIL 5600UH
L 404	5159081	CHOKE COIL 180UH+−10%
L 801	5159071	CHOKE COIL 33UH+−10%
L1501	5159077	CHOKE COIL 100UH+−10%
L1502	5159077	CHOKE COIL 100UH+−10%

CRYSTALS

X 201	5781742	CRYSTAL 4.46MHZ
X 701	5781582	CRYSTAL
X 901	5783001	CRYSTAL
X1601	5780535	XTAL
X1602	5784641	CRYSTAL 5.32MHZ

MISCELLANEOUS

CP 201	5163685	LC FILTER
CP 202	5163805	LC FILTER
CP 203	5163553	LC FILTER
CP 204	5163204	COIL
CP 301	5163791	LC FILTER
CP 302	5785388	DELAY LINE
CP 303	5785491	DLAY LINE
CP 304	5163792	LC FILTER
CP 351	5160431	BANDPASS FILTER
CP1501	5163204	COIL
DG 701	5315074	FLUORESCENT INDICATOR TUBE
FU 851	5720175	FUSE 0.8A
FU 852	5720179	FUSE 1A
IR1701	5317191	MODULE,INF
QF 201	5721802	IC PROTECTER
QF1501	5721943	IC PROTECTOR
QF1502	5721943	IC PROTECTOR
S 141	5635321	SWITCH
S 142	5635331	SWITCH
S 301	5621541	SWITCH
S 302	5621531	SWITCH
S 701	5633911	SWITCH
S 702	5633911	SWITCH
S 703	5633911	SWITCH
S 704	5633911	SWITCH
S 705	5633911	SWITCH
S 706	5633911	SWITCH
S 707	5633911	SWITCH
S 708	5633911	SWITCH
S 709	5633911	SWITCH
S 710	5633911	SWITCH

SYMBOL-NO	P-NO	DESCRIPTION
S 711	5633911	SWITCH
S 712	5633911	SWITCH
S 713	5633911	SWITCH
S 714	5633911	SWITCH
⚠ SW 851	5605345	SWITCH

SYMBOL-NO	P-NO	DESCRIPTION
S1501	5622032	SWITCH
S1502	5622032	SWITCH
⚠ FU 851	5720175	FUSE 800mA
⚠ FU 852	5720179	FUSE 1A
⚠ FU 853	5721063	FUSE 1.25A

MECHANICAL PARTS LIST

SYMBOL-NO	P-NO	DESCRIPTION
		FOR FINAL ASSEMBLY
101	6004251	COVER,TOP
102	6004262	COVER,BOTTOM
103	6233273	PANEL,FRONT
104	6483077	DOOR,CASSETTE
105	6526952	PLATE
106	6801991	HINGE,BUTTON
107	7417171	HOLDER,HINGE
108	7419162	BRACKET
⚠ 110	5213953	TRANSFORMER,POWER
111	7703652	PLATE
112	6714216	NYLON RIVET
113	6802562	HOLDER,DIG
114	6795151	RIVET
115	5588352	TUNER IF BLOCK —For (DS)—
115	5588461	TUNER IF BLOCK —For(GK)—
116	5589121	RF CONVERTER —For(DS)—
116	5589161	RF CONVERTER —For (GK)—
117	5885991	PLUG CABLE
118	5676306	JACK PLATE
⚠ 119	5850793	CORD,POWER
120	7493904	PLATE,SHIELD
121	6802271	BRACKET
122	5722214	FUSE HOLDER
123	6407382	COVER
124	6898241	STUD
125	6795151	RIVET
126	6802042	LEVER,BUTTON
127	6407471	COVER,FUSE
128	7674011	CUSHION
129	6483811	PANEL,REAR —For (DS)—
129	6483812	PANEL REAR —For (GK)—
130	6527022	PLATE
131	6079341	KNOB,SLIDE
202	6911101	SCREW
203	7412852	BASE—ACE HEAD
204	5446631	HEAD—AUDIO CONTROL
205	6304906	SPRING
206	6522752	SPRING
207	7785673	NUT
208	6896914	HOLDER
209	6555501	SPRING
210	6415531	REEL—SUPPLY
211	7789123	POLYSLIDER WASHER
212	6415543	REEL,TAKE UP
213	7789122	POLYSLIDER WASHER
214	6975766	ARM,PRESSER ROLLER
215	6804273	BLOCK,SLIDER
216	7412822	PLATE

SYMBOL-NO	P-NO	DESCRIPTION
217	7412816	GEAR,LOADING (L)
218	7412806	GEAR,LOADING (R)
219	6911551	GUIDE ROLLER BASE(IN)
220	6344741	GUIDE ROLLER
221	6911572	BRACKET
222	6911003	BASE,CYLINDER
223	5445851	HEAD FULL ERASE
224	6897473	ARM,IMPEDANCE
225	4508237	GUIDE,TAPE
226	6555431	SPRING
227	7413665	HOLDER—BAND
228	7412863	ARM
229	6555444	SPRING
230	6897264	HOLDER
231	6896751	ARM
232	6555061	SPRING
235	7429673	LOADING BLOCK ASSY
236	7398631	BRACKET
237	7412881	ARM
238	6976551	ARM
239	7412892	ARM
240	7428072	ARM,OPERATION
241	6897241	ARM
242	6804842	BRACKET
243	6804791	BRAKE
244	6896894	HOLDER,MOTOR
245	6896852	ARM
246	6897251	ARM
247	6555483	SPRING
248	6897271	ARM
249	6897065	GEAR,MODE
250	6434861	WORM WHEEL
251	6555052	SPRING .
252	7799012	WASHER
254	4508235	GUIDE
261	1388246	PWB ASSYPRE—REC AMP
271	7415782	BRACKET
272	7415793	BRACKET
301	5571471	MOTOR,CAPSTAN
302	6896951	CULUTCH BASE ASSY
303	6351555	BELT
304	6897095	ARM,FF/REW
305	6434851	RACK
402	6804982	BRACKET
403	6804962	BRACKET
404	6896971	WORM WHEEL ASSY
405	6435571	WORM
406	4508221	WORM SHAFT
406	4508221	WORM SHAFT
407	6896632	ARM—SWITCH

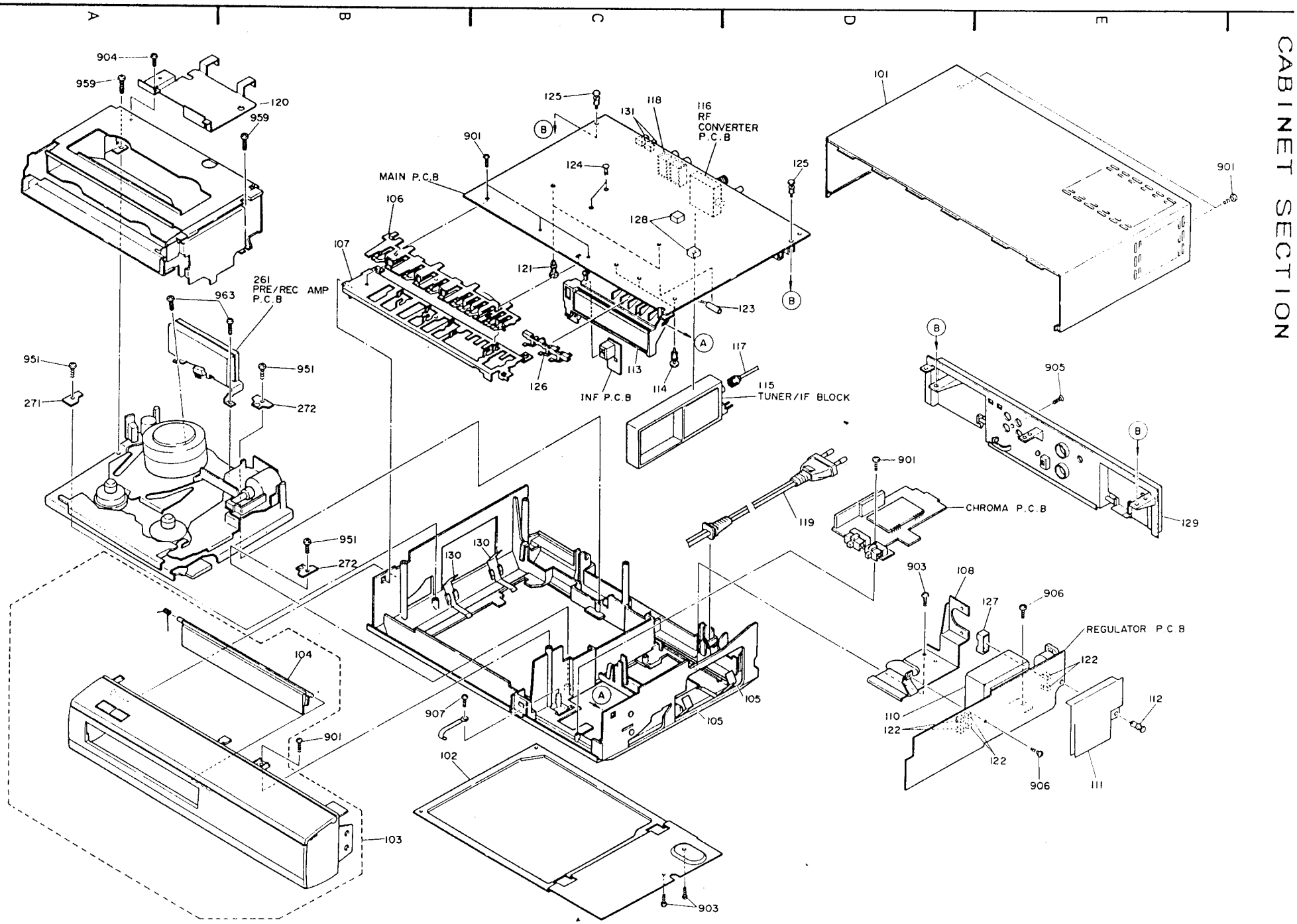
SYMBOL-NO	P-NO	DESCRIPTION
408	6897041	ARM-SWITCH
409	6302474	SPRING
410	6804992	BRACKET
411	7412583	BRACKET-GEAR
412	7449174	HOLDER,CASSETTE
413	7449164	BASE,CASSETTE HOLDER
414	6896664	HOLDER,CASSETTE (R)
415	7428113	HOLDER,STAY
416	6806641	ARM
417	6897001	ARM
418	6555043	SPRING
419	6896673	HOLDER,CASSETTE (L)
420	7412944	ARM
421	6555771	SPRING
422	7412952	SPRING
423	6806531	HOLDER,FRONT
424	7580791	SHAFT ASSY
425	7428982	BRACKET
427	7794391	WASHER
501	5436101	UPPER CYLINDER(CY-Z2P)
502	5436049	LOWER CYLINDER(CY-Z2P)
503	5792633	BRUSH
901	7781138	SCREW(3X10BT)
903	8699406	SCREW (3X6)
904	8691406	3X6 BT BIND SCREW

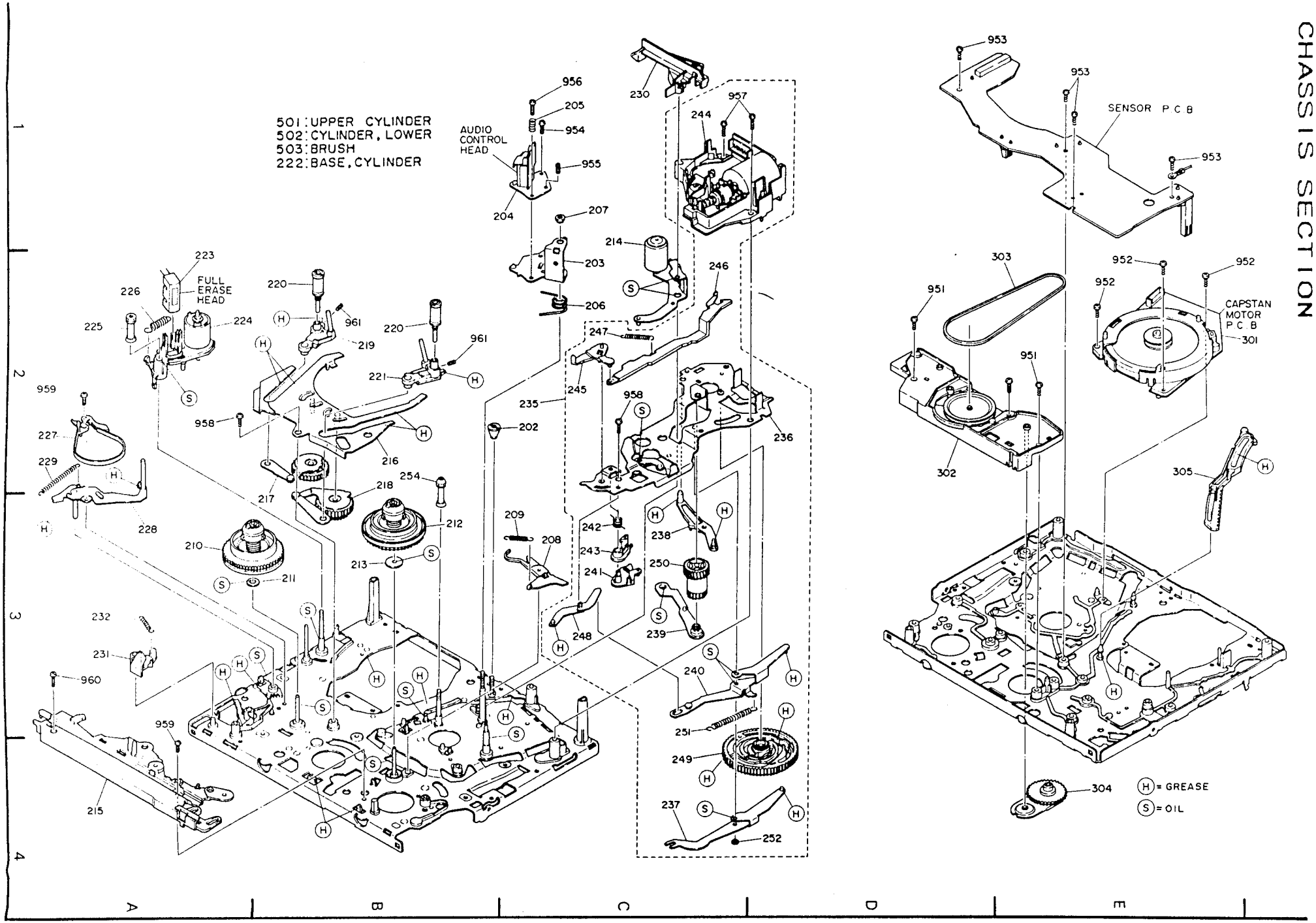
SYMBOL-NO	P-NO	DESCRIPTION
905	7781582	FALT SCREW-3MMDX10MM (BLACK)
906	8671405	DT SCREW-3MMDX5MM
907	8699410	SCREW(3X10)
951	8691410	SCREW
952	8691310	SCREW
953	8699408	SCREW
954	7781872	SCREW-3MMDX8MM
955	7773086	SCREW
956	8741414	SCREW (3X14)
957	8691412	SCREW (3X12)
958	8691408	SCREW (3X8)
959	8741408	SCREW (B3X8)
960	8741412	SCREW (B3X12)
961	7785941	SCREW
963	8711404	SCREW - 3X4 PAN HEAD SCREW

FOR ACCESSARIES

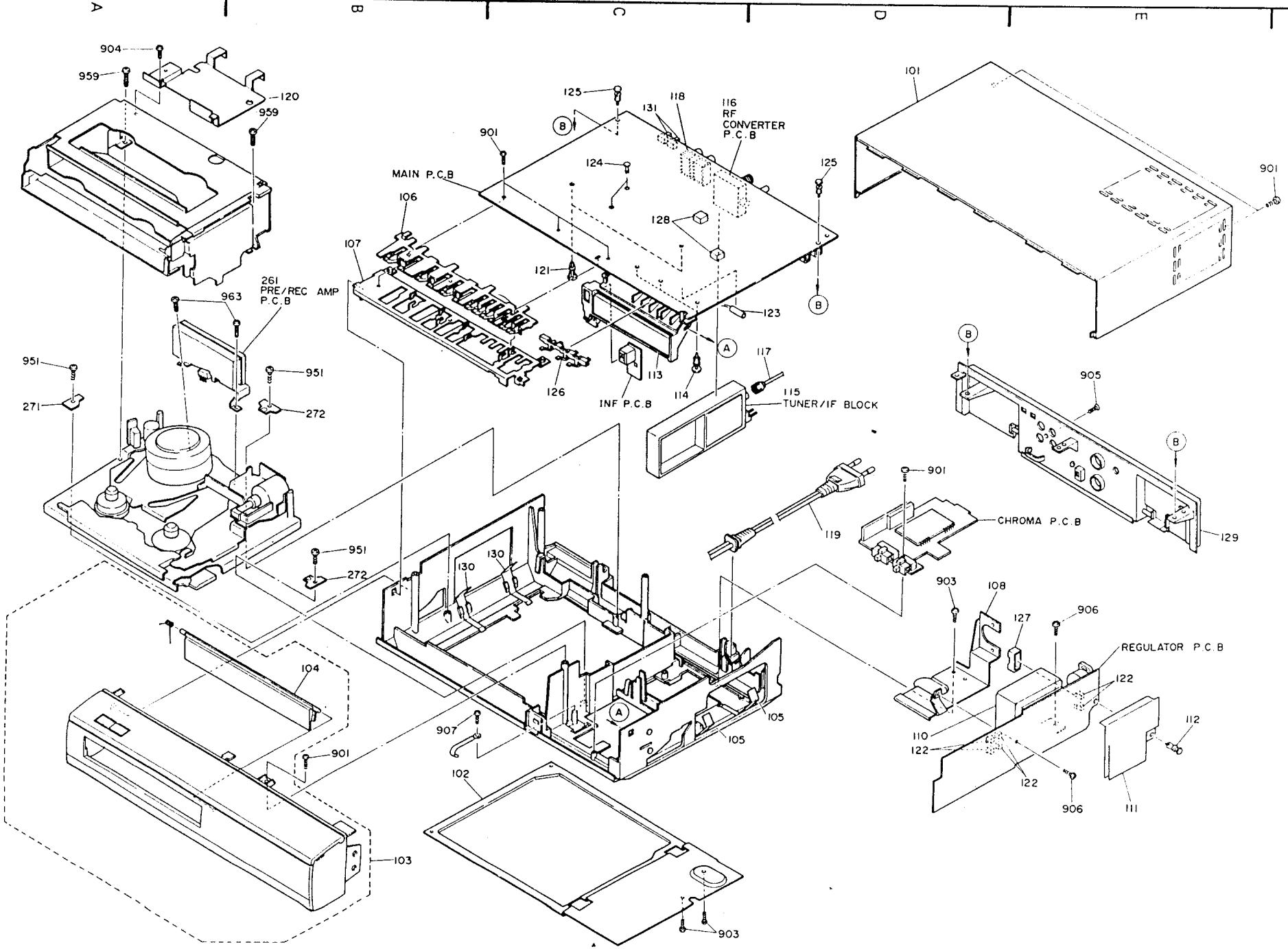
	5898876	CONNECTER CORD
	5652291	SOCKET ADAPTER
	5618324	REMOTE CONTROL HAND SET

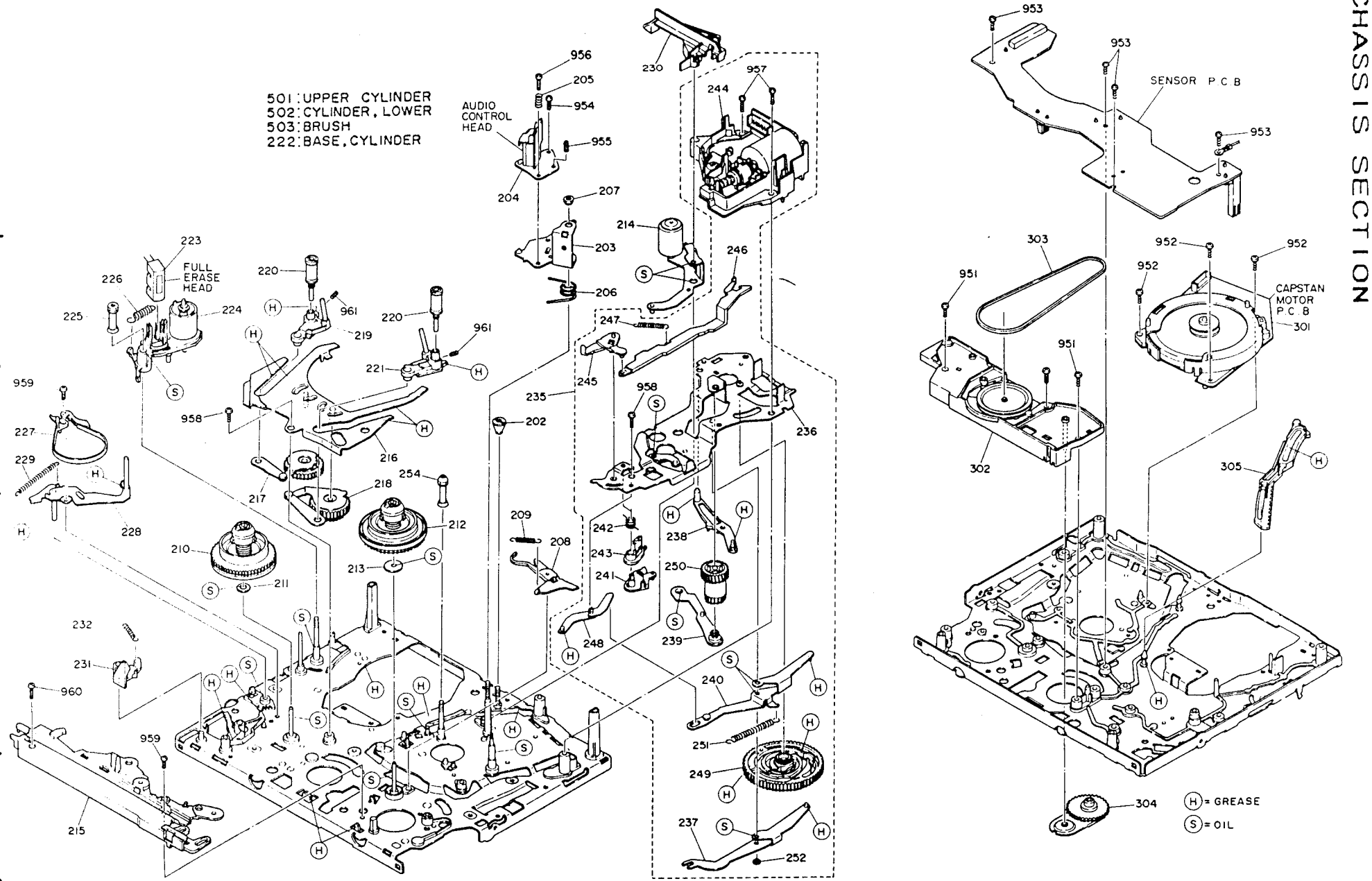
CABINET SECTION



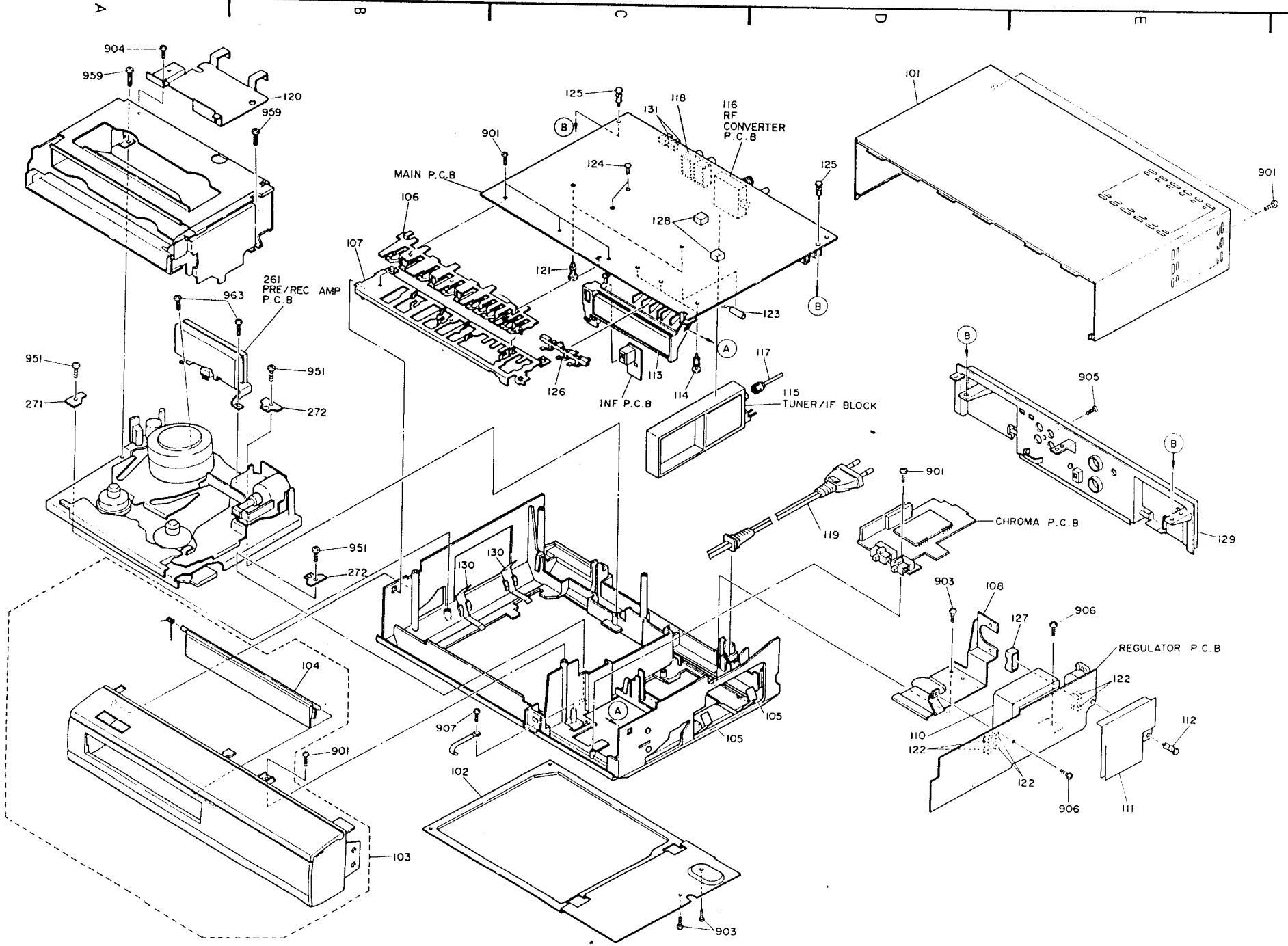

501:UPPER CYLINDER
502:CYLINDER, LOWER
503:BRUSH
222:BASE, CYLINDER
AUDIO CONTROL HEAD
FULL ERASE HEAD
SENSOR P.C.B
CAPSTAN MOTOR P.C.B
(H) = GREASE
(S) = OIL

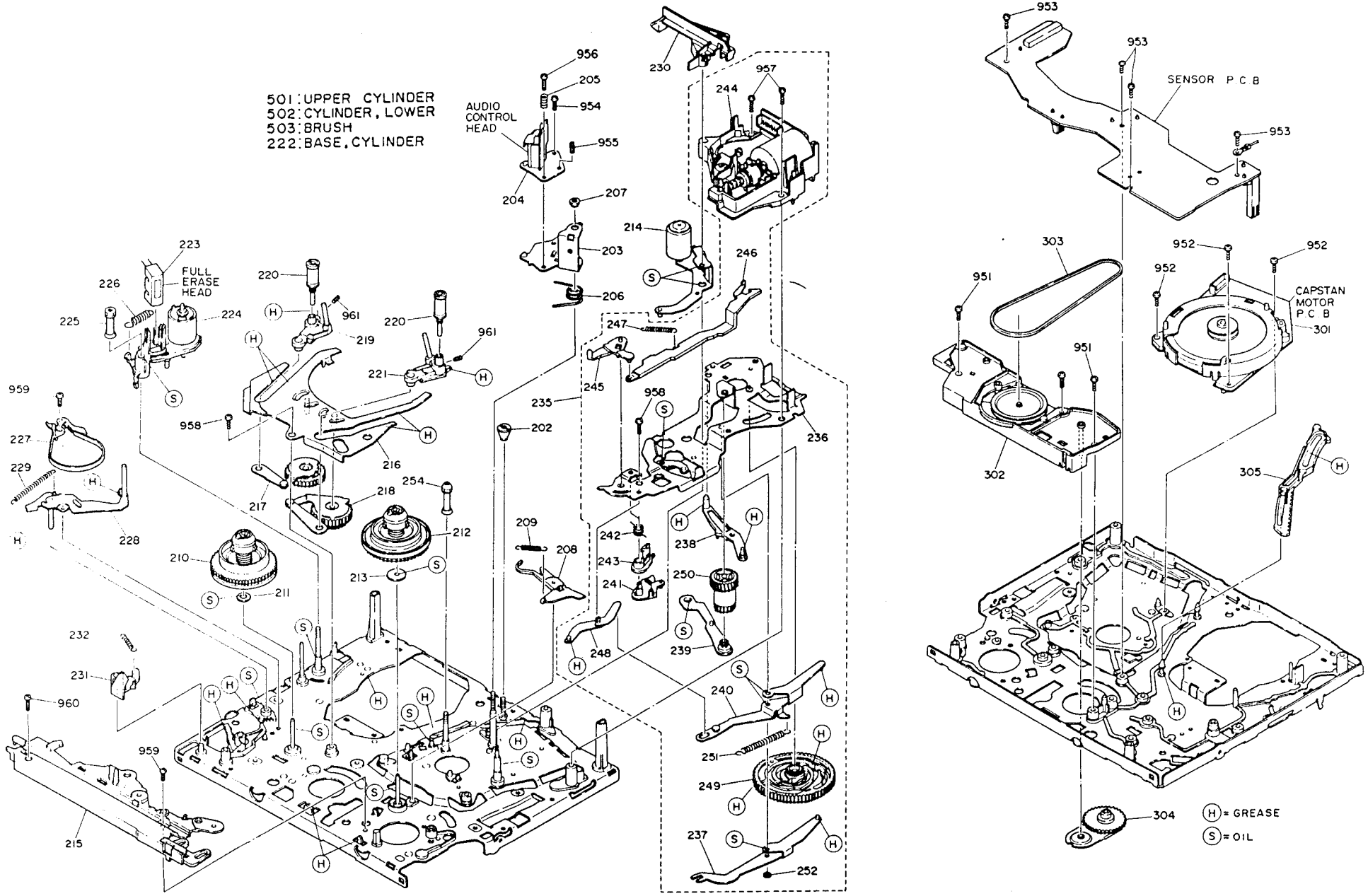
CABINET SECTION




501 : UPPER CYLINDER
502 : CYLINDER, LOWER
503 : BRUSH
222 : BASE, CYLINDER
AUDIO CONTROL HEAD
FULL ERASE HEAD
SENSOR P.C.B
CAPSTAN MOTOR P.C.B
(H) = GREASE
(S) = OIL

CABINET SECTION




501:UPPER CYLINDER
502:CYLINDER, LOWER
503:BRUSH
222:BASE, CYLINDER
AUDIO CONTROL HEAD
FULL ERASE HEAD
SENSOR P C B
CAPSTAN MOTOR P C B
(H) = GREASE
(S) = OIL

CASSETTE LOADING MECHANISM SECTION